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Contemporary Philosophy of Medicine

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Introduction

Contemporary medicine is fragmented in terms of approaches to what it is or should be, as well as to how it is or should be practiced. Approaches to the nature of medicine range from traditional logical and empirical accounts to humanistic and phenomenological ones, while approaches to its practice range from Evidence-Based Medicine to Patient-Centered Medicine. These approaches often involve different philosophical perspectives. For example, a reductionist perspective is foundational to standard biomedicine, whereas a holistic perspective is foundational to integrative medicine. In the present bibliography, entries on General Overviews, Edited Volumes, professional Journals, and online resources are listed initially, followed by different approaches to medicine's nature and practice, ranging from the Logic of Medicine to Integrative Medicine. The bibliography concludes with entries on Medical Ontology, including Disease, Health, and Medical Causation, and on Medical Epistemology, including Medical Knowledge and Explanation, Medical Informatics, and Clinical Judgment and Decision Making. Finally, the bioethics and medical ethics literature has not been included, since it constitutes a separate field of scholarship in the philosophy of medicine.

General Overviews

Contemporary philosophy of medicine begins with the publication of Pellegrino and Thomasma 1981, with almost twelve hundred citations, according to Google Scholar—impressive for a non-bioethical book. Since its publication, the frequency of introductory expositions has increased considerably—at least four since the late 2010s (Broadbent 2019, Giroux 2018, Stegenga 2018, and Thompson and Upshur 2018). Most of the recent works acknowledge that contemporary philosophy of medicine is "a burgeoning field" and is now comparable to other fields, especially in philosophy of science (Thompson and Upshur 2018). Indeed, a chapter on philosophy of medicine was included in a companion to the philosophy of science (Giroux 2018); and Johansson and Lynøe 2008 and Lee 2012 use philosophy of science to frame and construct a philosophy of medicine. The entries in this section represent not only general overviews of the discipline (Bunge 2013) but also views from particular philosophical perspectives and with specific agendas (Tomasi 2016).

Broadbent, Alex. *Philosophy of Medicine*. New York: Oxford University Press, 2019.

"This book sets out," as the author states, "to answer two big questions about medicine: 'What is medicine' and 'What attitude should we adopt toward it?'" (p. xv). He insists these two questions are urgent since "Mainstream Medicine"—as he calls the biomedical model—is on the one hand more effective today in terms of therapy, but on the other, the public is less trustful of it. In two major parts of the book, he sets out to answer the two questions.

Bunge, Mario. *Medical Philosophy: Conceptual Issues in Medicine*. Singapore: World Scientific, 2013.

The author's main thesis is that "medicine has always been saturated with philosophy" (p. xiii). For him, philosophy is of service to medicine in terms of its nature and practice. To that end, in the first two chapters, he explores the role of philosophy in historical medicines and

modern medicine. In the remaining eight chapters, he examines how philosophy functions with respect to conceptions of disease, diagnosis, pharmaceutical drugs, clinical trials, therapy, prevention, iatroethics, and medicine's role in society.

Giroux, Élodie. "Philosophy of Medicine." In *The Philosophy of Science: A Companion*. Edited by Anouk Baberousse, Denis Bonnay, and Mikael Cozic, 464–509. New York: Oxford University Press, 2018.

The author informs the reader that the chapter represents philosophy of medicine as the domain of philosophy of science in contrast to bioethics. To that end, the concepts of health, disease, and illness are initially analyzed vis-à-vis the scientific nature of medicine. Next, the author examines the causes and explanations of diseases, especially in terms of proof, from a biomedical theoretical perspective. Finally, problems arising from causal analysis and experimentation are explored, along with the nature of clinical reasoning.

Johansson, Ingvar, and Niels Lynøe. *Medicine and Philosophy: A Twenty-First Century Introduction*. Frankfurt: Ontos, 2008.

The authors frame the book in terms of the philosophy of science, initially discussing the notions of scientific fact, argumentation, and knowledge. They then introduce a number of topics contextualized with respect to a clinical paradigm that envisions the patient in terms of mechanism. They subsequently discuss topics such as placebo and nocebo phenomena and medical pluralism, as well as both clinical and research ethics. Finally, they conclude with examining the ontology of taxonomy and partonomy in science.

Lee, Keekok. *The Philosophical Foundations of Modern Medicine*. New York: Palgrave Macmillan, 2012.

Divided into three parts. In the first, the author covers topics in the philosophy of science, including reductionism, mechanism, and theoretical biology. In the next part, she discusses the patient as mechanism, as well as the technological developments to diagnose and treat diseases. In the final part, she covers issues concerning disease causation, including nosology and the monogenetic conception of disease, and proceeds to linear disease causation, along with causation in random control trials and epidemiological studies.

Pellegrino, Edmund D., and David C. Thomasma. *A Philosophical Basis of Medical Practice: Toward a Philosophy and Ethic of the Healing Professions*. New York: Oxford University Press, 1981.

A classic in terms of a general overview of philosophical issues involved in contemporary medicine and its practice. The authors discuss initially what constitutes medicine as a profession. They then tackle the moral nature of medicine with respect to individual and social ethics. In a review of the book, although Eric Cassell expressed some reservations about it, he acknowledged, "It is an important book that should be widely read" (*The Quarterly Review of Biology* 57.4 [1982]: 493–495).

Stegenga, Jacob. *Care and Cure: An Introduction to Philosophy of Medicine*. Chicago: University of Chicago Press, 2018.

"Philosophy of medicine," claims the author, "has become a vibrant intellectual landscape" and the book represents "a map of that landscape" (p. 1). The book is divided into four parts. The first examines the critical concepts of health, disease, and death. The next part discusses the notions of causation, holism and reductionism, and controversial diseases. The third part explores evidence and inference, along with associated issues. The final part pertains to issues in psychiatry and public health and in policy formation.

Thompson, R. Paul, and Ross E. G. Upshur. *Philosophy of Medicine: An Introduction*. Abingdon, UK, and New York: Routledge, 2018.

In agreement with Giroux, the authors claim that philosophy of medicine is "a sub-field of philosophy of science" (p. vii). Accordingly, logic, metaphysics, and epistemology rather than ethics drive their introduction. The authors discuss various topics in medicine, such as health and disease, theories and models, materialism and reductionism, causality and induction, randomized controlled trials and meta-studies, phenomenology, and clinical reasoning. They also explore various models of modern medicine, such as evidence-based medicine, evolutionary medicine, precision and personalized medicine, and alternative medicine.

Tomasi, David Låg. *Medical Philosophy: A Philosophical Analysis of Self-Perception in Diagnostics and Therapy*. Stuttgart, Germany: Ibidem-Verlag, 2016.

According to the author, the book's intent "is directed at a deeper understanding of human nature, examining the links and mutual influence between perception, beliefs, sense of meaning and purpose, and the healing process" (p. 23). To that end, the author briefly explores the history of medical philosophy before examining the role of philosophy in medicine and its practice, especially in terms of reasoning and cognitive processes. The focus is on the patient's self-perception as the center of both diagnosis and therapy.

Edited Volumes

With the publication in 2017 of three edited volumes in philosophy of medicine (Marcum 2017; Schramme and Edwards 2017; Solomon, et al. 2017), Patrick Daly announced that "contemporary philosophy of medicine has come of age as a distinct field of investigation" ("Philosophy of Medicine 2017: Reviewing the Situation," *Theoretical Medicine and Bioethics* 38, no. 6 [2017]: 483). In addition to the edited volumes for each specific section or subsection, the following edited volumes represent collections of essays or articles addressing broadly the issues in the philosophy of medicine. The entries range considerably, with respect to both perspectives and agendas. For example, Evans, et al. 2004 is a collection of essays addressing practical issues in clinical practice, while Gifford 2011 represents a collection of essays from a theoretical or philosophy of science perspective. Marcum 2017 is a collection of essays that surveys the current research in contemporary philosophy of medicine and provides resources for conducting research within it. Schramme and Edwards 2017 represents a collection of essays on philosophy of medicine that spans its scientific dimensions to its ethical, political, and social dimensions. Solomon, et al. 2017 also represents an expansive exploration of contemporary philosophy of medicine, examining topics from health and disease to phenomenology.

Evans, Martyn, Pekka Louhiala, and Raimo Puustinen, eds. *Philosophy for Medicine: Applications in a Clinical Context*. Oxford: Radcliffe, 2004.

The editors inform the reader that the genesis of the collection of essays was to introduce "the philosophical questions which inevitably arise in medical practice in all its forms" (p. v). In broad strokes, the essays' authors tackle not only the theoretical issues challenging medical science but also the practical issues facing its practice, especially the clinical encounter. The issues range from the nature of medicine itself and the clinical encounter to the aesthetics, uncertainty, and morality associated with medical practice.

Gifford, Fred, ed. *Philosophy of Medicine*. Handbook of Philosophy of Science 16. Oxford: North Holland, 2011.

Since this edited volume appears in the Handbook of the Philosophy of Medicine series, the focus is on philosophy of medicine as a subdiscipline of the philosophy of science, and it explores various topics in the medical sciences. Topics covered include the theoretical, such as Boorse's essay on the nature of health and disease, and the practical, such as Lizza's essay on brain death, as well as various traditional topics such as medical experimentation and discovery, causality, ontology, and uncertainty.

Marcum, James A., ed. *The Bloomsbury Companion to Contemporary Philosophy of Medicine*. London: Bloomsbury, 2017.

Divided into three parts. The first contains an introduction to the collection of essays and a chapter on the problems and methods in contemporary philosophy of medicine. The second part explores current research in the field, ranging from molecular and genomic medicine to patient-centered medicine, along with chapters on health and disease, medical causation, clinical reasoning, and new directions for research. The final part contains resources for research, including glossary, research guide, and annotated bibliography.

Schramme, Thomas, and Steven Edwards, eds. *Handbook of the Philosophy of Medicine*. Dordrecht, The Netherlands: Springer Science+Business Media, 2017.

Represents a Herculean effort to explore medicine not only philosophically in terms of its scientific dimension but also with respect to its ethical, political, and social dimensions. The topics covered in the handbook range from traditional concepts such as health and disease to their social and political determinants, which are divided into seven sections including "Core Concepts in Health Care," "Organisms," "Patients," "Clinical Settings and Healthcare Personnel," "Medical Knowledge," Nosology," and "Health as a Social and Political Issue."

Solomon, Miriam, Jeremy R. Simon, and Harold Kincaid, eds. *The Routledge Companion to Philosophy of Medicine*. New York: Routledge, 2017.

Divided into six parts. The first explores general concepts such as disease and health, while the second part covers specific concepts between birth and death. The next part examines medical research, ranging from observation trials to meta-analysis, while the subsequent section covers topics such as clinical judgement and medical decision making. The fifth part discusses diversity in medicine, such as gender and race. The final section pertains to various perspectives in medicine, such as biomedical, evolutionary, and phenomenological.

Springer's Philosophy and Medicine Series

At present, around 150 volumes have appeared in the influential Philosophy and Medicine series, published first by Reidel, then by Kluwer, and now by Springer. H. Tristram Engelhardt Jr. and Stuart F. Spicker were the founding editors. The series publishes monographs and collections of essays on both bioethics and philosophy of medicine. It also consists of four subseries: Catholic Studies in Bioethics, Asian Studies in Bioethics and the Philosophy of Medicine, European Studies in Philosophy of Medicine, and Classics in Medical Ethics. Carson and Burns 1997 is a twenty-year retrospective and analysis of philosophy of medicine within the series. Engelhardt 2000 contains articles celebrating a pioneer in philosophy of medicine. Seifert 2004 is an examination of "philosophical diseases" of the philosophy of medicine as a profession. Cooper 2005 explores the nature of mental illness, especially in terms of natural kind. Kincaid and McKitrick 2007 is an examination of topics in philosophy of medicine from a philosophy of science perspective. Ho 2017 explores the philosophical issues involved in the development, distribution, and use of pharmaceutics. Al-Akiti and Padela 2022 examines modern biomedicine's ontological, epistemological, and theological impact on Islam. Finally, Marcum 2008 is a general introduction to the philosophy of medicine, especially the shift from a biomedical approach to a humanistic one.

Al-Akiti, Afifi, and Asim I. Padela, eds. *Islam and Biomedicine*. Philosophy and Medicine 137. Cham, Switzerland: Springer, 2022.

Islam has a had a powerful influence on the development of Western science, especially in terms of mathematics, but today finds itself challenged by modern biomedicine and its technological advances. The editors compile a collection of insightful essays that explore the ontological, epistemological, and theological impact of modern biomedicine upon the Islamic tradition. The edited volume's goal is to bridge the gap between the technological advances in biomedicine and the Islamic faith.

Carson, Ronald A., and Chester R. Burns, eds. *Philosophy of Medicine and Bioethics: A Twenty-Year Retrospective and Critical Appraisal*. Philosophy and Medicine 50. Dordrecht, The Netherlands: Kluwer, 1997.

Essays celebrate two decades of scholarly work in the philosophy of medicine, as published in the series, and address questions concerning the history and theory of medicine and bioethics, the practice and theory of medicine and bioethics, and policy issues in medicine and bioethics. They cover, in general, the history of medicine, the practice and theory of medicine, and policy issues in medicine. The editors provide an informative introduction to progress in the philosophy of medicine and bioethics.

Cooper, Rachel. *Classifying Madness: A Philosophical Examination of the Diagnostic and Statistical Manual of Mental Disorders*. Philosophy and Medicine 86. New York: Springer, 2005.

First examines the nature of mental disorders and then addresses the question of whether they represent natural kinds. The problem with determining what a mental disorder is pertains to the sociopolitical-ladenness of theories. Concludes by discussing the implications of

theory-ladenness for classifying mental disorders in the *Diagnostic and Statistical Manual* (*DSM*), which is used globally by psychiatrists to classify mental disorders.

Engelhardt, H. Tristram, Jr., ed. *The Philosophy of Medicine: Framing the Field*. Philosophy and Medicine 64. Dordrecht, The Netherlands: Kluwer, 2000.

Essays are in honor of one of the framers of philosophy of medicine, Stuart Spicker. In tribute to him, the editor claims that Spicker's "vision of bioethics and the philosophy of medicine has had an enduring impact on this field" (p. 1). Essays address philosophical and bioethical issues on embodiment, death, and euthanasia, along with paternalism, and topics ranging from nature of the mind to the role of state policy on medical practice.

Ho, Dien, ed. *Philosophical Issues in Pharmaceutics: Developing, Dispensing, and Use*. Philosophy and Medicine 122. Dordrecht, The Netherlands: Springer Science+Business Media B.V., 2017.

Essays are divided into three sections and cover important philosophical and ethical issues facing the pharmaceutical industry. The first section concerns issues in the development of pharmaceutics, such as patient-driven drug development and the industry's hegemony of pharmaceutic knowledge. The next section explores issues in dispensing pharmaceutics, such as prescription paternalism and pharmaceutical marketing. The final section pertains to issues in pharmaceutical usage, such as addition and enhancement.

Kincaid, Harold, and Jennifer McKitrick, eds. *Establishing Medical Reality: Essays in the Metaphysics and Epistemology of Biomedical Science*. Philosophy and Medicine 90. New York: Springer, 2007.

This collection of essays breaks with the myopia of bioethical issues associated with medicine and discusses the metaphysical and epistemological issues associated with the biomedical sciences. The editors provide an introductory essay framing a philosophy of science approach to biomedicine. Topics covered include notions of health and disease, mental illness, clinical trials and experimental medicine, public health, women's medicine, and the notion of equipoise.

Marcum, James A. *An Introductory Philosophy of Medicine: Humanizing Modern Medicine*. Philosophy and Medicine 99. Dordrecht, The Netherlands: Springer Science+Business Media B.V., 2008.

The author explores the quality of care and professionalism crises challenging modern medical practice and the efforts to humanize what is thought to be an overly technical and scientific biomedicine. After an introductory chapter examining the relationship between philosophy and medicine, he charts the metaphysical, presuppositional, ontological, epistemological, methodological, axiological, and ethical changes required to humanize contemporary medicine. In a concluding chapter, the author addresses the question of whether medicine is an art or a science.

Seifert, Josef. *The Philosophical Diseases of Medicine and Their Cure. Vol. 2, Foundations*. Philosophy and Medicine 82. Dordrecht, The Netherlands: Springer, 2004.

The author's thesis is that the reduction of medicine and its practice to science and technology has resulted in "philosophical diseases" of the profession and has yielded a crisis in medicine that leads to what he claims is "anti-medicine." The cure for these diseases, according to the author, is to restore the proper philosophical and ethical ends of medicine vis-à-vis the good of the patient, especially the patient's dignity, through philosophical and ethical analysis and reflection.

Journals

Over the past several decades, the number of journals devoted exclusively to philosophy of medicine has grown noticeably. *Journal of Medicine and Philosophy*, *Philosophy of Medicine*, *Theoretical Medicine and Bioethics*, and *Medicine, Health Care and Philosophy: A*

European Journal are excellent examples of these types of journals, which contain articles on a variety of issues within the philosophy of medicine and medical ethics. In addition, *Medicine Studies*; *Philosophy, Ethics, and Humanities in Medicine*; and *Perspectives in Biology and Medicine* contain articles exploring an even wider field of topics, while *Journal of Evaluation of Clinical Practice* and *Journal of Medicine and the Person* are dedicated to special topics in the philosophy of medicine.

***Journal of Evaluation of Clinical Practice*. 1995–.**

Aim is the evaluation of health-care practices, particularly those that are evidence based. Also publishes articles addressing health-care policies and management.

***Journal of Medicine and the Person*. 2009–2015.**

Goal was to integrate a humanistic dimension to clinical practice, especially in terms of multidisciplinary care.

***Journal of Medicine and Philosophy*. 1976–.**

Scope varies, from bioethical issues to epistemological questions, concerning medical knowledge, and ontological issues, concerning the nature of health and illness.

***Medicine, Health Care and Philosophy: A European Journal*. 1998–.**

Is the publication venue for the European Society for Philosophy of Medicine and Health Care. Topics range from general issues in the philosophy of medicine and bioethics to social and legal issues facing health care and its practice.

***Medicine Studies*. 2009–2014.**

Founded with the aim of exploring the intersection of medicine with various disciplines, including philosophy and ethics, social science, science and technology, and medical humanities.

***Perspectives in Biology and Medicine*. 1957–.**

Aim is to solicit contributions on the nature of biology and medicine and their role in contemporary society, especially from a philosophical or historical perspective.

***Philosophy, Ethics, and Humanities in Medicine*. 2006–.**

Part of the *BioMed Central* (*BMC*) series. Its goal is "a more comprehensive understanding of health and wellness that purposefully aligns the wants and needs of patients and practitioners, and attends to the individual human condition and public health in ways that modern medicine has at times neglected" (Home page).

***Philosophy of Medicine*. 2020–.**

"Publishes exceptional original philosophical research and perspectives on all aspects of medicine, including medical research and practices" (About page). Its section, "The Examination Room," publishes material for wider public discussion.

***Theoretical Medicine and Bioethics*. 1980–.**

Originally appeared in 1980 as *Theoretical Medicine* and published articles on general topics in the philosophy of medicine, including biomedical ethics. Added *Bioethics* to its name in the late 1990s.

Encyclopedias, Online Databases, and Organizations

The *Internet Encyclopedia of Philosophy* and the *Stanford Encyclopedia of Philosophy* are online encyclopedias that provide articles on general and specific topics in the philosophy of medicine. Other online databases, Mendeley Philosophy of Medicine and PhilPapers Philosophy of Medicine, provide bibliographic resources for philosophy of medicine and bioethics. Organizations promoting advancement in the philosophy of medicine include the Philosophy & Medicine; the University of Oxford Centre for Evidence-Based Medicine; the Ulm University Institute of the History, Philosophy and Ethics of Medicine; the European Society for Philosophy of Medicine and Healthcare; and the International Philosophy of Medicine Roundtable.

European Society for Philosophy of Medicine and Healthcare.

Founded in 1987 and is composed of scholars interested in a broad array of philosophical issues facing the growth of medicine and health care.

Internet Encyclopedia of Philosophy.

Contains articles pertinent to the philosophy of medicine, such as "Bioethics," "Cloning," and "Philosophy of Medicine."

International Philosophy of Medicine Roundtable.

A group of scholars interested in metaphysical and epistemological issues in medicine, but not necessarily to the exclusion of ethical issues.

Mendeley Philosophy of Medicine.

Released by Elsevier in 2008, it contains a variety of articles on the philosophy of medicine and bioethics.

Philosophy & Medicine.

Founded in 2009 through funding from the Wellcome Trust and since 2015 is a joint initiative with the Peter Sowerby Foundation.

PhilPapers Philosophy of Medicine.

Maintained by the Centre for Digital Philosophy at the University of Western Ontario, it provides bibliographic resources for topics, such as disease and illness, health, medical ethics, and psychiatry.

Stanford Encyclopedia of Philosophy.

Contains articles relevant to philosophy of medicine, including "Concepts of Disease and Health," "Disability: Definitions, Models, Experience," "Mental Illness," "Philosophy of Psychiatry," and "Well-Being."

Ulm University Institute of the History, Philosophy and Ethics of Medicine.

Founded in 2008 and focuses on various issues in the history of medicine, medical ethics, medical humanities, and philosophy of medicine.

University of Oxford Centre for Evidence-Based Medicine.

Founded in 1995 and is "committed to improving healthcare by fostering wider communication of high quality evidence, by promoting the principles of EBM through engagement, knowledge sharing, research and education" (About page).

Philosophies of Medicines

Today, the philosophy of medicine is certainly a growing discipline, with a substantial literature and with regular diverse conferences and societies. But the discipline has no single overarching paradigm, in the Kuhnian sense, that brings consensus to it. Rather, the field is fragmented with a variety of perspectives and approaches not only to the problems at hand, but also to how best to examine and resolve them. Thus, the philosophical perspectives may be logical positivist or empiricist, analytic, or phenomenological. Moreover, medicine itself is fragmented, with patients opting for nontraditional allopathic treatments such as those offered by practitioners of holistic or complementary and alternative medicine. Thus, a better description of the contemporary interaction between philosophy and medicine is "philosophies of medicines." In the bibliographic list below, contemporary philosophy of medicine is represented by the various perspectives and approaches based either on the type of medicine under scrutiny (e.g., Darwinian medicine) or on the type of philosophy utilized to address the fundamental issues of the nature of medicine and its practice (e.g., phenomenology).

Logic of Medicine

When science eclipsed medicine's art during the early part of the twentieth century, logic became an important means by which to practice medicine. Clinicians are now scientists who use logic to infer diagnoses from clinical signs and symptoms (Jankowska, et al. 2010; Stanley and Campos 2013). Black 1968, a classic in the field, argues for the necessity of logic in robust clinical reasoning. With the advent of clinical trials, the role of logic became imperative to medical advancement, as defended in Philips 1995 and Murphy 1997. Finally, Barro and Marín 2002, Sadegh-Zadeh 2012, and Seising and Tabacchi 2013 champion fuzzy logic for examining medical concepts and practices.

Barro, Senén, and Roque Marín, eds. *Fuzzy Logic in Medicine*. Studies in Fuzziness and Soft Computing 83. New York: Springer, 2002.

The application of fuzzy logic to medicine is examined in terms of contemporary developments. And, as the editors note in their introduction, fuzzy logic "has been playing an ever more prominent role in the medical domain" (p. 5). Topics range from its use in the diagnosis of common diseases—such as coronary heart disease—to monitoring anesthesia and analyzing medical data such as ECG and EEG signals.

Black, Sir Douglas. *The Logic of Medicine*. Edinburgh: Oliver & Boyd, 1968.

A classic in the field and attempts to restore an appreciation for the intellectual rigor needed to practice medicine. To that end, the author initially discusses the nature of medicine and disease, followed by discussion of diagnosis and the clinical management of disease. The book concludes by discussing issues facing medicine's future, including the use of computers in medicine, attitudes towards mental health, and health-care economics.

Jankowska, Dorota, Anna Justyna Milewska, and Urszula Górska. "Applications of Logic in Medicine." *Studies in Logic, Grammar and Rhetoric* 21.34 (2010): 7–24.

The authors acknowledge the importance of logical thinking involved in many of the clinical decisions physicians must make in providing effective health care. They examine both classical and nonclassical logical approaches to such decision making. In terms of classical logic,

they discuss logical deductive inference, whether certain or uncertain. For nonclassical logic, they examine the application of both temporal and fuzzy logic to clinical reasoning.

Murphy, Edmond A. *The Logic of Medicine*. 2d ed. Baltimore: Johns Hopkins University Press, 1997.

In this book—initially published in 1976—the author examines issues in medical ontology, including the nature of linguistic statements with respect to abstraction, definition, causes, the nature of disease and its classification, and the issue of uncertainty in diagnosis. Next, he discusses issues in medical epistemology, such as proof, modeling, bias, and confounding, concluding with a critical analysis of epistemological standards in medical knowledge.

Philips, Calbert I., ed. *Logic in Medicine*. 2d ed. London: BMJ Publishing, 1995.

A collection of articles previously published in the *British Medical Journal*. The main topic is the role of logic in clinical reasoning and decision making. Besides traditional logic, the collection also discusses Bayesian logic and clinical reasoning. The second edition—the first was published in 1988—includes material on the role of logic in statistical analysis, medical law and ethics, and medical sociology.

Sadegh-Zadeh, Kazem. *Handbook of Analytic Philosophy of Medicine*. 2d ed. Philosophy and Medicine 113. New York: Springer, 2012.

The second edition represents an expanded and a corrected edition of the first. The author claims "to clarify the conceptual, methodological, epistemological, moral, logical, and metaphysical foundations of medicine in order to understand what occurs in the doctor-patient clinical encounter; what factors, forces, and sciences determine the dynamics and products of this interaction system; and how best to organize it." To that end, he begins with the language of medicine and concludes with medical metaphysics.

Seising, Rudolf, and Marco E. Tabacchi, eds. *Fuzziness and Medicine: Philosophical Reflections and Application Systems in Health Care: A Companion Volume to Sadegh-Zadeh's Handbook of Analytical Philosophy of Medicine*. Studies in Fuzziness and Soft Computing 302. Berlin: Springer-Verlag, 2013.

The book is a collection of essays that serve as a companion volume to the first edition of Sadegh-Zadeh. It covers introductory material on fuzziness and medicine, along with philosophical and ethical issues associated with fuzziness. It also discusses the role of models and representations in medicine, the nature of medical thinking, statistical and probabilistic issues in medicine, and data analysis and decision making in the clinic.

Stanley, Donald E., and Daniel G. Campos. "The Logic of Medical Diagnosis." *Perspectives in Biology and Medicine* 56.2 (2013): 300–315.

The authors claim that there is a problem within the medical literature in terms of an over emphasis on evaluating statistical evidence such that the logic behind making medical diagnosis is often eclipsed. To remedy the problem, they introduce Peircean abductive logic and triadic logic of inquiry. They go on to examine various methods or strategies of differential diagnosis, including gestalt recognition, algorithmic investigation, steepest ascent, hypothetico-deductive, exhaustive inquiry, and deferral, vis-à-vis Peircean logic.

Epidemiology-Population Medicine

Probably the most important philosophical notion in epidemiology is causal inference, beginning with Hill 2015 and its efforts to establish criteria for causal inference. Rothman and Greenland 2005 provides a general overview of causation in epidemiology, while Tavris 1997 represents a general introduction to philosophical issues in epidemiology. And Broadbent 2013 introduces philosophers of science to the potential of epidemiology as a resource for addressing issues in the philosophy of science. Gray 2013 and Orkin, et al. 2017 discuss the clinical application of population medicine, especially in terms of pedagogical initiatives, while Valles 2018 and Venkatapuram and Broadbent 2023 discuss various philosophical issues confronting population health science and medicine.

Broadbent, Alex. *Philosophy of Epidemiology*. New York: Palgrave Macmillan, 2013.

Over the past decade, the book has become a classic for the philosophy of epidemiology. The author motivates the book by defending the appropriateness of epidemiology as a legitimate topic for philosophical reflection and investigation. Specifically, he takes up the fundamental notions of induction and causation, which can be problematic for epidemiologists. He then examines predictions, especially in terms of making and assessing them. He concludes by discussing puzzles of attributability, risk relativism, and multifactorialism, as well as legal issues.

Gray, J. A. Muir. *How to Practice Population Medicine*. Oxford: Offox, 2013.

Provides a practical exposition not only for practicing population medicine but also for why it should be practiced, that is, individual health depends upon the population health. In other words, both types of health complement one another. And the duty of the 21st-century clinician is to enhance and promote overall health through providing the right services for the right outcomes that reduce waste and enhancing sustainability and equity.

Hill, Austin Bradford. "The Environment and Disease: Association or Causation?" *Proceedings of the Royal Society of Medicine* 108.1 (2015): 32–37.

Originally published in 1965, this article is *the* definitive text on the nature of causation in epidemiology, with well over ten thousand citations (according to Google Scholar). The author identifies nine "viewpoints"—or criteria, as most epidemiologists call them, although Hill avoids the term—for establishing a causal link, including strength of association, its consistency and specificity, temporal relationship, biological gradient and plausibility, coherence with known facts, supportive empirical evidence, and analogical reasoning.

Orkin, Aaron M., Aamir Bharmal, Jenni Cram, Fiona G. Kouyoumdjian, Andrew D. Pinto, and Ross Upshur. "Clinical Population Medicine: Integrating Clinical Medicine and Population Health in Practice." *Annals of Family Medicine* 15.5 (2017): 405–409.

The authors discuss the integration of population health into clinical practice to achieve "the Triple Aim challenge to improve patient experience and curtail health care expenditures while improving population health" (p. 405). To that end, they propose "Clinical Population Medicine" in which both individual and population health are combined simultaneously. For a critique, see Andrew N. Rouble, Rim Zayed, Bart J. Harvey, and Lawrence C. Loh, "Integrating Clinical Medicine and Population Health: Where to From Here?" *Canadian Journal of Public Health* 110, no. 6 (2019): 801–804.

Rothman, Kenneth J., and Sander Greenland. "Causation and Causal Inference in Epidemiology." *Journal Information* 95.S1 (2005): S144–S150.

An overview of the role and nature of causation and causal inference in epidemiology. Discusses the philosophical implications of the inability to prove conclusively a causal relation, and goes on to propose that causation in epidemiology should be viewed modestly as the measurement of an effect, such as the risk ratio of lung cancer and smoking/nonsmoking.

Tavris, Dale R. *Philosophy in Epidemiology and Public Health*. Commack, NY: Nova Science, 1997.

Introduces key concepts in epidemiology and public health, followed by a discussion of common misconceptions pertaining to animal experimentation, laboratory tests, abortion, and infectious disease. The author then examines issues concerning statistical tests and determining causation, social and political values, concepts of health and disease, legal topics such as malpractice and confidentiality, and challenges facing the future of epidemiology and public health.

Valles, Sean A. *Philosophy of Population Health: Philosophy for a New Public Health Era*. Abingdon, UK, and New York: Routledge, 2018.

In a beginning chapter, the author formulates a "blueprint" for a philosophy of/for population health. He then divides the remaining chapters into three parts, each of which focuses on a specific question. In the first part, the question concerns the meaning of health for population health science, while the second part examines the question over the pertinent causes and effects of population health. The final part takes up the question over whether population health science can address population health inequities.

Venkatapuram, Sridhar, and Alex Broadbent, eds. *The Routledge Handbook of Philosophy of Public Health*. Abingdon, UK, and New York: Routledge, 2023.

In this collection of essays, a broad host of philosophical topics are discussed, ranging from fundamental concepts to the ethical and social implications of public health. The essays are divided into four parts, with the first two parts examining the basic concepts and methods of public health. The final two parts contain essays addressing the various ethical, social, and political problems facing global public health, especially health inequities and injustices.

Evidence-Based Medicine

With Evidence-Based Medicine Working Group 1992, evidence-based medicine was publicly inaugurated—sparking a debate comparable to the one that flared up during the first half of the twentieth century over the art and science of medicine (Sehon and Stanley 2003). Sackett, et al. 1996 provides an oft-quoted definition for evidence-based medicine to quell the debate, and Guyatt and Busse 2008 offers a concise overview of evidence-based medicine. Goodman 2003 and Daly 2005 are sympathetic to evidence-based medicine, but they raise important ethical considerations. Epistemologically, Djulbegovic, et al. 2009 weighs in on the debate over the nature of evidence for justifying medical knowledge and practice. The debate has simmered down, and evidence-based medicine, after the inclusion of clinical experience, is rapidly becoming the standard for Western medicine with respect to its pedagogy and clinical practice, as discussed in Howick 2011.

Daly, Jeanne. *Evidence-Based Medicine and the Search for a Science of Clinical Care*. Berkeley: University of California Press, 2005.

The author raises important philosophical issues about the role of evidence-based medicine in clinical practice. Although she is sympathetic to advances made in evidence-based medicine toward practicing quality health care in a professional manner, she recognizes its limitations "to generate a science appropriate for the whole of clinical practice, in all its complexity, including the social and political contexts of patients and the health care system."

Djulbegovic, Benjamin, Gordon H. Guyatt, and Richard E. Ashcroft. "Epistemologic Inquiries in Evidence-Based Medicine." *Cancer Control* 16.2 (2009): 158–168.

Assesses the debate over evidence-based medicine in terms of epistemological theories including logical positivism, falsificationism, theory-ladenness of observation, holism, instrumentalism, and the underdetermination thesis. Concludes that evidence-based medicine draws from each of these theories and that it is not necessarily a new way of understanding medicine, but rather it is "a continuously evolving heuristic structure for optimizing clinical practice" (p. 158).

Evidence-Based Medicine Working Group. "Evidence-Based Medicine. A New Approach to Teaching the Practice of Medicine." *Journal of the American Medical Association* 268.17 (1992): 2420–2425.

The initial introduction of evidence-based medicine, with its authors representing it as a Kuhnian paradigm shift vis-à-vis the traditional clinician expertise model. Rather than relying on clinical intuition and unsystematic experience, the authors champion clinical practice based on the best available evidence from randomized clinical trials. And they outline pedagogical strategies for training medical personal in the art of evidence-based medicine.

Goodman, Kenneth W. *Ethics and Evidence-Based Medicine: Fallibility and Responsibility in Clinical Science*. New York: Cambridge University Press, 2003.

Reviews the origins and history of evidence-based medicine and provides an insightful analysis of the challenges facing it. Also examines the technological issues of databases and data mining in terms of the human dimension of clinical practice, concluding with a discussion of the ethical issues arising from the implementation of evidence-based medicine at the bedside and in terms of public health policy.

Guyatt, Gordon H., and Jason W. Busse. "The Philosophy of Evidence-Based Medicine." In *Users' Guides to the Medical Literature: A Manual for Evidence-Based Clinical Practice*. 2d ed. Edited by Gordon Guyatt, Drummond Rennie, Maureen O. Meade, and Deborah J. Cook, 5–16. New York: American Medical Association, 2008.

The chapter presents a concise introduction to evidence-based medicine with respect to a philosophical analysis of the principles animating it, as well as an able discussion of the challenges facing its future. The authors identify two fundamental principles of evidence-based medicine. The first is evidence is necessary but not sufficient for making clinical decisions, which also require cost-benefit analysis and inclusion of patient values, while the second involves a hierarchy of evidence.

Howick, Jeremy H. *The Philosophy of Evidence-Based Medicine*. Chichester, UK: Wiley-Blackwell, 2011.

The book is without doubt the standard treatise on the philosophy of evidence-based medicine. The author first introduces the notions of evidence-based medicine and "good" evidence for making clinical decisions. He then examines whether randomized clinical trials can provide the evidence necessary to sustain evidence-based practice. Finally, he addresses the criticism that evidence-based medicine excludes clinical expertise and mechanistic reasoning, and he proposes a modified version of evidence-based medicine that includes them.

Sackett, David L., William M. C. Rosenberg, J. A. Muir Gray, R. Brian Haynes, and W. Scott Richardson. "Evidence Based Medicine: What It Is and What It Isn't." *British Medical Journal* 312.7023 (1996): 71–72.

A response to critics of evidence-based medicine, including criticisms ranging from it is simply old hat to it suppresses clinical freedom. The authors provide a definition of it that has been quoted extensively in the literature, even though it has not led to consensus: "Evidence based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients."

Sehon, Scott R., and Donald E. Stanley. "A Philosophical Analysis of the Evidence-Based Medicine Debate." *BMC Health Services Research* 3.1 (2003): 14.

The authors claim that what motivates the debate over evidence-based medicine is the lack of a precise, unambiguous definition of evidence-based medicine. In addition, they claim that advocates of evidence-based medicine polarize the debate by likening it to a Kuhnian paradigm shift. Rather, the authors propose that Quine's web-of-belief is an apt metaphor for characterizing evidence-based medicine vis-à-vis alternative approaches to medicine.

Darwinian-Evolutionary Medicine

Although Darwinian or evolutionary biology had a major impact on modern society during the twentieth century, not until the century's end was it systematically incorporated into medicine (Ruse 2017). Nesse and Williams 1996 represents the first book-length discussion of Darwinian or evolutionary medicine. Brüne and Schiefenhövel 2019 is a comprehensive handbook on evolutionary medicine. Stearns and Koella 2008 and Trevathan, et al. 2008 address various topics and challenges involved in the nature of evolutionary medicine, while Gluckman, et al. 2016 provides principles of evolutionary medicine for application to the clinic. Lieberman 2013 is an introduction to evolutionary medicine exploring health-care conundrums facing modern humans, and Moltzau Anderson and Horn 2020 tackles the interdisciplinary challenges facing evolutionary biology implementation into medicine.

Brüne, Martin, and Wulf Schiefenhövel, eds. *The Oxford Handbook of Evolutionary Medicine*. New York: Oxford University Press, 2019.

Divided into three major parts. The first is concerned with the general principles of evolutionary medicine, ranging from an introductory essay on its core principles to principles involved in cell signaling, genetics and epigenetics, development, growth, and aging. The second examines specific systems from an evolutionary perspective, including the musculoskeletal, immune, cardiovascular, respiratory, digestive, and excretory systems. In the final part, the editors provide a glimpse into the future of medicine vis-à-vis evolutionary medicine.

Gluckman, Peter, Alan Beedle, Tatjana Buklijas, Felicia Low, and Mark Hanson. *Principles of Evolutionary Medicine*. 2d ed. New York: Oxford University Press, 2016.

An introductory text to the principles informing evolutionary medicine and its application to clinical practice. After outlining the general principles of evolutionary biology, the authors incorporate specific examples to illustrate the utility of evolutionary biology for understanding human health and disease, with a final section presenting a framework for applying evolutionary principles to medicine and public health.

Lieberman, Daniel E. *The Story of the Human Body: Evolution, Health, and Disease*. New York: Pantheon, 2013.

Addresses the paradox modern humans find themselves in vis-à-vis health and disease in the industrial era. The paradox is that we live during one of the healthiest periods in human history with respect to infectious diseases, but chronic diseases such as cardiovascular diseases and obesity are epidemic. Claims the solution requires the incorporation of human evolutionary history into decisions about developing a healthful culture.

Moltzau Anderson, Jacqueline, and Florian Horn. "(Re-)Defining Evolutionary Medicine." *Ecology and Evolution* 10.20 (2020): 10930–10936.

The authors acknowledge that a tension exists between medicine and evolutionary biology in terms of implementing the latter into the clinic and medical curriculum. After briefly defining evolutionary medicine in terms of "how" and "why" questions, they introduce a timeline for human evolution to provide a framework for incorporating evolutionary principles into medical theory. They conclude with addressing the interdisciplinary discourse challenges facing the operationalization of evolutionary medicine.

Nesse, Randolph M., and George C. Williams. *Why We Get Sick: The New Science of Darwinian Medicine*. New York: Vintage Books, 1996.

Now the classic of Darwinian or evolutionary medicine. In it, the authors explore the relevance of Darwinian evolution for answering the question of "why we get sick." If natural selection can shape such robust organs as the eye, why can it not shape an organism resistant to disease? The authors address these questions by applying the fundamental principles of evolutionary biology to understanding the nature of disease and its causes.

Ruse, Michael. "Evolutionary Medicine: Philosophical Aspects." In *The Bloomsbury Companion to Contemporary Philosophy of Medicine*. Edited by James A. Marcum, 147–160. London: Bloomsbury, 2017.

The author begins by exploring the lag from the introduction of Darwinian evolution to its incorporation into medical practice. He then examines the impact of evolutionary thinking on medicine, especially in terms of the mother-offspring conflict and multivariant selection. Finally, the author discusses the implication of evolutionary biology for understanding disease and health and concludes that health pertains more than simply to survival and reproduction.

Stearns, Stephen C., and Jacob C. Koella, eds. *Evolution in Health and Disease*. 2d ed. Oxford: Oxford University Press, 2008.

The second edition of the book—the first was published in 1999—examines a variety of medical topics from an evolutionary perspective. After an introductory essay on evolutionary thinking in medicine, the remaining essays explore the history of the human genome and its variation, evolutionary conflicts emerging from pregnancy to behavioral ecology, the appearance of pathogens, and noninfectious and degenerative diseases.

Trevathan, Wenda, Euclid O. Smith, and James J. McKenna, eds. *Evolutionary Medicine and Health: New Perspectives*. New York: Oxford University Press, 2008.

Contributors are mostly anthropologists, and the topics covered reflect their interests, including the impact of modern nutrition and diet on health and illness, sex and reproduction, the evolutionary role of environment and ecology in health and disease, and chronic diseases. Concludes by addressing issues facing the intersection of evolutionary biology and medicine, as well as the significance of that intersection for medicine's future.

Molecular-Genomic Medicine

Molecular or genomic medicine is the logical extension of a reductionist approach to medicine (Boenink 2017). Clark 1997 and Trent 2012 are excellent introductions and provide able discussions of the challenges facing molecular or genomic medicine in the twenty-first century. Ten Have 2001 discusses the geneticization thesis, while Manolio, et al. 2013 adapts genomic medicine to the clinic. Feero, et al. 2010 is a primer on genomic medicine, and Boniolo and Nathan 2017 examines four philosophical questions facing molecular medicine. Gibbon, et al. 2018 explores the impact of genomics beyond the clinic and research laboratory to include ethical, social, and political challenges.

Boenink, Marianne. "Disease in the Era of Genomic and Molecular Medicine." In *The Bloomsbury Companion to Contemporary Philosophy of Medicine*. Edited by James A. Marcum, 65–91. London: Bloomsbury, 2017.

The author succinctly summarizes the goal of genomic medicine: "Visions of a genomic medicine suggest that sequencing a person's DNA early on may enable prediction of health problems later on, and that knowledge of a patient's genomic profile may help to choose the most effective treatment" (p. 65). After briefly rehearsing the emergence of genomic medicine, she discusses the impact genomic and epigenetic analyses, especially from a systems perspective, provide for developing personalized medicine.

Boniolo, Giovanni, and Marco J. Nathan, eds. *Philosophy of Molecular Medicine: Foundational Issues in Research and Practice*. New York and Abingdon, UK: Routledge, 2017.

This collection of essays is centered around four major philosophical questions facing molecular medicine. The first concerns the origins, nature, and scope of molecular medicine, while the second question pertains to how molecular medicine provides explanations for medical phenomena, particularly diseases such as cancer. The third question addresses how pathological processes such as carcinogenesis can be represented and modeled, while the final question explores the types of inferences that can be made from relevant clinical data.

Clark, William A. *The New Healers: The Promise and Problems of Molecular Medicine in the Twenty-First Century*. New York: Oxford University Press, 1997.

The author explores the rise of molecular or genetic medicine. Beginning with the discovery of genes for cystic fibrosis and severe combined immunodeficiency disease, he discusses the potential and problems facing gene therapy. He also discusses the role of molecular medicine in treating cancer and AIDS, along with the development of novel vaccines, the Human Genome Project, and the ethical issues facing molecular medicine.

Feero, W. Gregory, Alan E. Guttmacher, and Francis S. Collins. "Genomic Medicine—An Updated Primer." *New England Journal of Medicine* 362.21 (2010): 2001–2011.

The authors introduce concepts informing genomic medicine and the role of genes in disease etiology. In the updated primer (the original was published in 2002), they discuss the future of genomic medicine. The authors provide an extensive glossary of terms used in genomic medicine. And they review the recent technological developments for analyzing genomes and conclude with a discussion of genomic medicine's future.

Gibbon, Sahra, Barbara Prainsack, Stephen Hilgartner, and Janelle Lamoreaux, eds. *Routledge Handbook of Genomics, Health and Society*. 2d ed. Abingdon, UK, and New York: Routledge, 2018.

The handbook is centered around four basic themes not only in implementing genomics into the clinic but also into society itself. The first is the globalization of genomics, while the second theme involves the stability and instability of (post)genomics. The last two themes are the role of big data in genomic medicine, and the importance and value of genomic technology in optimizing health.

Manolio, Teri A., Rex L. Chisholm, Brad Ozenberger, et al. "Implementing Genomic Medicine in the Clinic: The Future is Here." *Genetics in Medicine* 15.4 (2013): 258–267.

Represents a report of the US National Human Genome Research Institute in which vested stakeholders were convened to discuss recent advances and challenges to translating genomic research into the clinic. A key challenge was development of infrastructure to make genomic information available for clinical application. Another challenge was identifying the clinical relevance of genomic variants. Concludes by proposing an implementation roadmap for incorporating genomic data into clinical practice.

ten Have, Henk A. M. J. "Genetics and Culture: The Geneticization Thesis." *Medicine, Health Care and Philosophy* 4.3 (2001): 295–304.

The author examines the geneticization of medicine and culture at large, especially in terms of the moral and ethical issues raised by genetic technology. He then argues that it can be used to refocus the discussion of medical care from individual autonomy and rights to interpersonal relationships embedded in a cultural context, which he claims are often ignored in the bioethical literature.

Trent, Ronald J. *Molecular Medicine: Genomics to Personalized Healthcare*. 4th ed. London: Academic Press, 2012.

As the author notes, the new edition emphasizes the impact molecular medicine has on realizing the goals of personalized medicine, which is taken up in the initial chapter. In addition, besides earlier topics ranging from genetics to ethical and legal issues in molecular medicine, the new edition includes updates and new additions to the field of molecular medicine, particularly omics technology and whole genome sequencing, along with direct-to-consumer DNA testing kits.

Precision Medicine

In 2011 the US National Research Council published a report officially introducing the notion of precision medicine (National Research Council 2011). In 2015, then–US President Obama announced to the public the Precision Medicine Initiative (Collins and Varmus 2015). Since then, precision medicine has become a major global trajectory for contemporary medicine's future (Barker 2017) and represents a "new biomedical cosmology" (Vegter 2018). Indeed, precision medicine does promise to transform medicine (Cerrato and Halamka 2018), although it does face challenges toward that end (Verma and Barh 2017). Joyner and Paneth 2019 questions the promises of precision medicine, while Denny and Collins 2021 identifies seven ways to realize its promise by 2030.

Barker, Richard W. "Is Precision Medicine the Future of Healthcare?" *Personalized Medicine* 14.6 (2017): 459–461.

To answer the question concerning the future of health care, the author defines precision medicine rather broadly to include not just genomics but also other omics including epigenomics, metabolomics, microbiomics, and exposomics vis-à-vis lifestyle choices, along with

wearable technology and machine learning. Concludes that precision medicine is the future of health care, and to realize that future will require "new generations of new precision diagnostic, prognostic, therapeutic and digital products" (p. 461).

Cerrato, Paul, and John Halamka. *Realizing the Promise of Precision Medicine: The Role of Patient Data, Mobile Technology, and Consumer Engagement*. London: Academic Press, 2018.

Begins with contrasting population-based medicine's average or one-size-fits-all approach to the patient with precision medicine's tailored approach. Goes on to discuss the path toward realizing precision medicine, beginning with US Precision Medicine Initiative. Topics covered include genomics, data analytics, mobile technology and electronic health records, and various research tools. Concludes with discussing limitations and barriers to implementing and operationalizing precision medicine, along with privacy and security challenges.

Collins, Francis S., and Harold Varmus. "A New Initiative on Precision Medicine." *New England Journal of Medicine* 372.9 (2015): 793–795.

Begins by quoting then–President Obama's announcement of the Precision Medicine Initiative. Goes on to define precision medicine as the "prevention and treatment strategies that take individual variability into account" (p. 793). Identifies two main components of the initiative. The first is an immediate focus on understanding and treating cancer and the second on implementing what is learned from the first "to the whole range of health and disease" (p. 793).

Denny, Joshua C., and Francis S. Collins. "Precision Medicine in 2030—Seven Ways to Transform Healthcare." *Cell* 184.6 (2021): 1415–1419.

Begins with praising precision medicine for the effective response to the COVID-19 pandemic. Then charts the path for implementation of precision medicine over the next decade to realize its promise for improving health care and health equitably. To that end, the authors identify seven opportunities to achieve that goal; including large cohort studies; inclusion and diversity; big data and artificial intelligence; routine clinical genomics; electronic health records; phenomics and exposomics; and trust, privacy protection, and return of value.

Joyner, Michael J., and Nigel Paneth. "Promises, Promises, and Precision Medicine." *Journal of Clinical Investigation* 129.3 (2019): 946–948.

The authors confront the promises of precision medicine at its inception. As they note, those promises have yet to be fulfilled and argue that "the foundational assumptions of precision medicine are unsound" (p. 946). Focusing only on the genetics of disease, the authors point to the limits of this approach and conclude that many of the health problems facing society, such as chronic diseases, the opiate crisis, and even "the next influenza pandemic," should take center stage in health-care initiatives.

National Research Council. *Toward Precision Medicine: Building a Knowledge Network for Biomedical Research and a New Taxonomy of Disease*. Washington, DC: National Academies Press, 2011.

The premise of the report is that patients' molecular genomics and biology can provide "a new taxonomy of human disease" (p. 1). And with this new taxonomy, biomedical research can be tailored to develop diagnostic tests and therapeutic drugs that precisely target the disease's molecular pathology and thereby improve health outcomes. To that end, the report made a half-dozen recommendations to collect copious data on patient clinical and molecular data to form a Disease Knowledge Network.

Vegter, Mira W. "Towards Precision Medicine; A New Biomedical Cosmology." *Medicine, Health Care and Philosophy* 21.4 (2018): 443–456.

Explores whether precision medicine represents a new biomedical cosmology in the sense of novel terminology, altered patient-clinician relationship, and disease and health conceptualization. Drawing on Michel Foucault, the author identifies three axes along which precision

medicine has transformed modern medicine. The axes are biomedical knowledge, power, and the patient's selfhood. Although he acknowledges that precision medicine surpasses traditional medicine, it does so at a risk of reducing the patient to mere data.

Verma, Mukesh, and Debmalya Barh, eds. *Progress and Challenges in Precision Medicine*. Amsterdam: Elsevier, 2017. [ISBN]

As the editors note in their preface, precision medicine exhibits "tremendous potential in developing tailor-made preventive diagnostics, therapeutics, and management strategies based on an individual's 'omics' profiles . . . , family history, lifestyle, environmental exposures, and other characteristics in any complex disease" (p. xxi). And the book's sixteen essays unpack that potential in detail with respect to genomic technologies and their application to cancer, population health, and primary medicine. The book ends with precision medicine trends and potential growth for emerging countries.

Systems Medicine

Systems medicine is an outgrowth of systems biology, especially with respect to postgenomic biology and the bioinformatic analysis of large datasets associated with omic assays (Marcum 2020). Ahn, et al. 2006 and Federoff and Gostin 2009 discuss the limitations of reductionism for traditional medicine and how systems medicine might resolve those limits not only in the clinic but also socially and ethically. Van der Greef, et al. 2007 investigates the application of large datasets to the practice of clinical medicine, and Wang, et al. 2021 discusses the role of deep learning in systems medicine. Hood 2013 was instrumental in introducing a P4 systems medicine that was predictive, preventive, personalized, and participatory. His P4 systems medicine has provided a framework for P7 systems medicine (Marcum 2021). Guoan, et al. 2011 explores the philosophical issues facing an integration of Eastern and Western medicine.

Ahn, Andrew C., Munseesh Tewari, Chi-Sang Poon, and Russell S. Philips. "The Clinical Applications of a Systems Approach." *PLoS Medicine* 3.7 (2006): e209.

The authors explore whether systems biology might play a role in overcoming the limitations of reductionism in terms of its clinical application. To that end, they analyze a reductive approach to diabetes and contrast it to a systems approach to the disease. They conclude that medicine, if it is going to resolve chronic diseases, needs to shift to "the system-level understanding of human health and disease at the organ, organism, and community level" (p. 4).

Federoff, Howard J., and Lawrence O. Gostin. "Evolving from Reductionism to Holism." *Journal of the American Medical Association* 302.9 (2009): 994–996.

In their commentary on the transition from modern biomedicine to systems medicine, the authors explore not only systems medicine's scientific and technical dimensions, but also its legal, social, economic, and ethical dimensions. Moreover, they address the goals of systems medicine, such as cost containment and quality of care, as well as its implications and challenges for medical education and practice.

Guoan, Luo, Wang Yiming, Liang Qionglin, Xie Yuanyuan, and Fan Xuemei. "System Medicine and Translational Medicine." *World Science and Technology* 13.1 (2011): 1–8.

The authors discuss the integration of Oriental medicine, particularly Traditional Chinese Medicine, and Western medicine, in order to develop a system medicine via translational medicine principles. To that end, they examine the underlying metaphysics of the two medical systems and identify five requirements, ranging from the microscopic to the macroscopic, for developing a system medicine that integrates Oriental and Western medicine.

Hood, Leroy. "Systems Biology and P4 Medicine: Past, Present, and Future." *Rambam Maimonides Medical Journal* 4.2 (2013): e0012.

Based on systems biology principles, the author introduces the notion of P4 systems medicine that is predictive, preventive, personalized, and participatory. And he concludes that "in 10 years each patient will be surrounded by a virtual cloud of billions of data points, and we will have the tools to reduce this enormous data dimensionality into simple hypotheses about how to optimize wellness and avoid disease for each individual" (p. 1).

Marcum, James A. *From Systems Biology to Systems Medicine*. New York: Nova Science, 2020.

Charts the emergence of systems medicine from systems biology, during the latter half of the twenty century and the beginning of the twenty-first century. The first half of the book explores the rise of systems biology as a discipline, while the second half examines the application of systems biology to medicine. The author's goal is to provide a disciplinary framework for the emergence of systems medicine.

Marcum, James A. "P7 Medicine: Humanizing Systems Medicine." *Teorema: Revista Internacional de Filosofía* 40.1 (2021): 213–231.

In an effort to humanize Hood's P4 systems medicine, the author proposes a P7 systems medicine. The Ps are divided into two sets. The first is composed of four Ps, with the physico-biomolecular, psycho-cognitive, and populational-public entangling to generate the personal, particularly from a personalist perspective. These personal data are then operationalized clinically in terms of predicting a disease and eliciting the patient's participation to prevent it.

van der Greef, J., S. Martin, P. Juhasz, et al. "The Art and Practice of Systems Biology in Medicine: Mapping Patterns of Relationships." *Journal of Proteome Research* 6.4 (2007): 1540–1559.

The authors discuss the role of systems biology in medicine, especially in terms of biomedical research for advancing "personal global health." Specifically, they introduce a platform for analyzing large datasets and consider the future implications of systems biology for medicine. In their conclusion, they explore and discuss the future implications of systems biology for medicine, especially in terms of systems pathology, pharmacology, and toxicology.

Wang, Haiying, Estelle Pujos-Guillot, Blandine Comte, et al. "Deep Learning in Systems Medicine." *Briefings in Bioinformatics* 22.2 (2021): 1543–1559.

The authors explore the role of deep learning in systems medicine. To that end, they first examine the development of deep learning algorithms and their implementation to the systems medicine landscape or framework to realize the predictive and preventive function of systems medicine clinically. The authors illustrate the power of deep learning using Parkinson's disease as a case study and conclude with a discussion of the challenges facing the application of deep learning to systems medicine.

Digital Medicine

Digital medicine is a product of the advances in the digital revolution in health care (Pereau 2018), and according to Topol 2013, it spells the radical transformation of traditional medicine. November 2012 provides a detailed history into the computerization of biomedicine during the second half of the twentieth century and its application to the clinic. André 2019 explores digital medicine's general nature, while Zhang, et al. 2018 grapples with defining it and its future. And Tikhonova, et al. 2022 explores the trends in digital technology for medicine. Cummins and Schuller 2020 and Greene and Lea 2019 discuss various challenges facing digital medicine, especially the ethical challenges.

André, Arthur, ed. *Digital Medicine*. Cham, Switzerland: Springer, 2019.

In the introduction to the collection of essays, the editor acknowledges that the digital revolution, especially in terms of information technology, is issuing in a new paradigm of medicine, particularly in terms of "diagnosis, treatment assignments, follow-ups, and prevention"

(p. 4). The topics covered in the book include telemedicine, precision medicine, preventive medicine, and regenerative medicine, along with artificial intelligence, biomarkers, eHealth, and omics technology. In a concluding essay, the editor presages digital medicine's future.

Cummins, Nicholas, and Björn W. Schuller. "Five Crucial Challenges in Digital Health." *Frontiers in Digital Health* 2 (2020): 536203.

The authors explore specifically five major challenges facing digital medicine in terms of health care. The first are societal challenges ranging from wearable technologies to political policies about such technologies. The next are ethical challenges, especially with respect to privacy and protection of an individual's health data. The third challenge is optimizing the connections among devices, patients, and clinicians. The final challenges pertain to integrating artificial intelligence and genomic technologies into effective and efficient health-care systems.

Greene, Jeremy A., and Andrew S. Lea. "Digital Futures Past—the Long Arc of Big Data in Medicine." *New England Journal of Medicine* 381.5 (2019): 480–485.

The authors explore medicine's response to the surge of big data during the latter part of the twentieth century in terms of electronic health records and information. They also examine big data's impact qua digital medicine on electronic diagnosis, particularly with respect to algorithmic machine learning. They also discuss the challenges associated with digital medicine, diagnostic accuracy, and privacy of information. In conclusion, however, the authors warn "about entrusting life-and-death matters to unseen algorithms" (p. 484).

November, Joseph A. *Biomedical Computing: Digitizing Life in the United States*. Baltimore: Johns Hopkins University Press, 2012.

Based on the author's 2006 dissertation in which he reconstructs the story of the computerization of the biomedical sciences and research in the second half of the twentieth century and the economic and political factors that were involved in the digitalization of life. The story begins with John Kendrew in the United Kingdom and Robert Ledley and Lee Lusted in the United States and ends with the rise of Stanford's leadership in negotiating interactions between life and computer scientists.

Pereau, Kevin. *The Digital Health Revolution*. Walnut Creek, CA: TranscendIT Health, 2018.

The author is a health-care consultant, who founded the consulting firm TranscendIT Health. In the book, he provides a layperson's account of the revolution in digital health, especially from his personal perspective and experience. The theme of the digital health revolution, according to the author, is shifting the focus from health-care providers at the center of the clinical encounter to health-care consumers through digital technology in order to keep people healthy and to avoid illness.

Tikhonova, Olga V., Tatyana G. Avacheva, and Nina V. Grechushkina. "Trends in the Development of Digital Technologies in Medicine." *Biomedical Engineering* 56.2 (2022): 137–141.

The authors identify the major trends in digital medicine, particularly at two interrelated levels. The first is in terms of the technology that is used to provide medical services and consultations, such as telemedicine. The second is the development of new medical devices and treatment methods, as well as the facilitation of more robust basic and clinical research. They then discuss the impact of the Internet of Medical Things for improving diagnosis, prevention, therapy, and rehabilitation.

Topol, Eric. *The Creative Destruction of Medicine: How the Digital Revolution Will Create Better Human Health Care*. New York: Basic Books, 2013.

According to the author, the digital revolution in health care signals a radical transformation or a "Schumpetered creative destruction" in medicine from traditional biomedicine to digital medicine, which he covers in three sections. In the first, he pours the foundation of patient empowerment through a digital landscape for contemporary digital medicine. The second section builds the infrastructure of digital medicine, while the final examines the habitation of that structure by *Homo digitus* and the benefits for providing quality health care.

Zhang, Shaoxiang, Rongxia Liao, Joseph S. Alpert, et al. "Digital Medicine: Emergence, Definition, Scope, and Future." *Digital Medicine* 4.1 (2018): 1–4.

After briefly reconstructing the history of digital medicine from an interdisciplinary practice to an independent discipline, the authors offer two definitions of it. The first is a narrow definition in terms of using technology to solve medical problems associated with diagnosis and treatment, while the second is a broad definition with respect to using technology to assist health-care institutions and administration in providing precision care.

Humanistic Medicine

With humanistic medicine, the approach or emphasis is not so much on the type of medicine—as was the case in the previous approaches—but on its delivery or practice. Humanistic medicine stresses the art of medicine, without neglecting the science of medicine. In other words, care and competence go hand-in-hand in the practice and delivery of quality, professional health care. Peabody 1927, reprinted many times, is the standard for practicing humanistic medicine and has influenced further development of this type of medicine. Pellegrino 1979 provides a philosophical foundation for humanistic medicine, while Brown, et al. 2005 examines the values involved in the change from a strictly scientific or evidence-based medicine to a humanistic or value-based medicine. Halpern 2001 examines the role of empathy in humanistic clinical practice. Cassell 2004 is a classic in the medical humanities literature, framing the role of medicine as relief of suffering rather than simply accurate diagnosis. And Maier and Shibles 2011 introduces a naturalistic-humanistic medicine based on metaphorical analysis of medical practice. Within the past half-decade, the role of the humanities has taken on greater importance and a sense of urgency in contemporary medicine (Ferry-Danini 2018, Thibault 2019).

Brown, Melissa M., Gary C. Brown, and Sanjay Sharma. *Evidence-Based to Value-Based Medicine*. Chicago: American Medical Association Press, 2005.

The authors chart the development of value-based medicine, a practice of medicine taking into account the patient's values and how best to achieve those values vis-à-vis quality health care. To that end, they provide necessary background information, and then discuss the relationship between evidence-based medicine and value-based medicine, addressing the role of value-based medicine in providing optimal quality health care.

Cassell, Eric J. *The Nature of Suffering and the Goals of Medicine*. 2d ed. New York: Oxford University Press, 2004.

Originally published in 1991, the book is a standard in the medical humanities literature—with over a thousand citations, according to Google Scholar. As the author so convincingly argues, relief of suffering is the goal of medicine; however, the goal is problematic, since suffering is often a subjective state. The book's main thesis is that the patient-physician relationship is the focal point for discharging the duty to relieve suffering.

Ferry-Danini, Juliette. "A New Path for Humanistic Medicine." *Theoretical Medicine and Bioethics* 39.1 (2018): 57–77.

According to the author, a new approach to humanizing medicine is needed besides narratology and phenomenology. The reason is that these two philosophies construct a straw man out of biomedicine and then reduce humanism simply to a psychological form of compassion. The problem is that humanism cannot be isolated to the patient-physician relationship but requires a broader outcomes-oriented approach that produces good health outcomes.

Halpern, Jodi. *From Detached Concern to Empathy: Humanizing Medical Practice*. New York: Oxford University Press, 2001.

The author argues for a transition from the traditional emotionally detached concern of clinical practice to the inclusion of empathy in the patient-physician encounter. To that end, she discusses, using a case study, how to manage emotions during clinical encounters, providing

a model for emotional reasoning. She also outlines a concept of clinical empathy and approaches to cultivating empathy in medical practice.

Maier, Barbara, and Warren A. Shibles. *The Philosophy and Practice of Medicine and Bioethics: A Naturalistic-Humanistic Approach*. Springer's International Library of Ethics, Law, and the New Medicine 47. New York: Springer, 2011.

The authors propose a "Metaphorical Method" for practicing medicine, which pertains to the use of metaphors to analyze medical practice, especially clinical decision making, and bioethics, such as organ donation. They analyze evidence-based medicine, and then examine the role of emotions in clinical practice. Lastly, they discuss topics like preventive medicine, medical counseling, and the interface between religion and medicine.

Peabody, Francis W. "The Care of the Patient." *Journal of the American Medical Association* 88.12 (1927): 877–882.

Without doubt, this influential paper is the definitive approach to humanistic medicine in which the art of medicine balances its science. For the author, the patient represents an "impressionistic painting" that includes not only the disease pathology but also the psychological, social, and even spiritual dimension of illness. As the author concludes, "the secret of the care of the patient is in caring for the patient" (p. 882).

Pellegrino, Edmund D. *Humanism and the Physician*. Knoxville: University of Tennessee Press, 1979.

The author examines the role of the humanities in medicine. Although he is sympathetic to the humanities in medical education and practice, he is unsympathetic if their use is insensitive to the philosophical issues associated with their use. He specifically explores medicine and the humanities writ large, humanities and medical ethics, and humanistic medical education, concluding with a discussion on the nature of humanistic medical practice.

Thibault, George E. "Humanism in Medicine: What Does It Mean and Why Is It More Important than Ever?" *Academic Medicine* 94.8 (2019): 1074–1077.

In this invited commentary, the author sounds an alarm that medical humanism has recently come under attack from anti-humanistic forces and policies. After clearly defining the role of humanism in medicine, he challenges the medical profession to confront these anti-humanistic forces and to reestablish medical humanism. He concludes with a story about his physician father and his humanitarian impact on a small village in rural New York to support the need for medical humanism.

Phenomenology and Medicine

Zaner 1981 introduces a phenomenological approach to medicine, especially in terms of the Self. Bizzari 2021 and Carel 2017 provide general overviews of phenomenology and medicine. Leder 1992 represents a phenomenological approach to the patient's body with respect to clinical practice. Svenaeus 2022 is a systematic analysis of medicine and its practice from a phenomenological perspective, while Dahl, et al. 2019 is an excellent volume of edited essays on the nature of the broken body. Meacham 2015 examines the ethical and social dimensions of the illness experience from a phenomenological perspective. And Toombs 2001 is a handbook of essays on the intersection of phenomenology and medicine.

Bizzari, Valeria. "Phenomenology and Medicine." In *The Routledge Handbook of Phenomenology and Phenomenological Philosophy*. Edited by Daniele de Santis, Burt C. Hopkins, and Claudio Majolino, 699–704. New York: Routledge, 2021.

The author draws upon Georges Canguilhem and his notion of the lived experience to forge a shift from the objectification of the biomedical body to its subjectification in terms of the clinical relationship. The body then is not simply reducible to its biology or even its psychology vis-à-vis treatment but is rather a Gestalt comprised of an Engelian bio-psycho-social whole.

Carel, Havi. "Phenomenology and Hermeneutics in Medicine." In *The Routledge Companion to Philosophy of Medicine*. Edited by Miriam Solomon, Jeremy R. Simon, and Harold Kincaid, 465–474. New York: Routledge, 2017.

The author examines the role of hermeneutics in exploring the meaning making that accompanies a phenomenological understanding of the lived body and its illness experience. She embeds the discussion within the distinction between the objective body of the biomedical model of disease and the subjective body of the illness experience. The advantage of the phenomenological approach to the lived body and its illness experience is providing the health-care professional a richer picture of the patient.

Dahl, Espen, Cassandra Falke, and Thor Eirik Eriksen, eds. *Phenomenology of the Broken Body*. New York and Abingdon, UK: Routledge, 2019.

After the editors' introduction to the broken body, the edited volume of essays is divided into three sections. The first concerns the vulnerability of the body in terms of its weakness and subjectivity to violence and trauma. The next section explores the suffering of the body with respect to brokenness, uncanniness, affectedness, pain, and fatigue. The final section deals with the possible recovery of broken bodies, including death itself.

Leder, Drew, ed. *The Body in Medical Thought and Practice*. Philosophy and Medicine 43. New York: Springer, 1992.

The editor claims that medicine "has progressively lost the human touch. Patients are often treated in a depersonalized, even dehumanized, fashion within the modern healthcare system" (p. 1). Medical practice is discussed by focusing on the nature of the patient's body, not as an object of medical scrutiny but as a person who is worthy of respect. To that end, a phenomenological overview is initially provided, along with discussions of specific diseases, of women's bodies, and of the body of the future.

Meacham, Darian, ed. *Medicine and Society, New Perspectives in Continental Philosophy*. Philosophy and Medicine 120. Dordrecht, The Netherlands: Springer Science+Business Media, 2015.

The essays originated from a series of seminars, "Medicine and Society," on continental approaches to bioethics and philosophy of medicine. An introductory section frames the remaining essays, especially by defining bioethics and by exploring the origins of illness. Subsequent sections include phenomenological approaches to the experience of illness, the distinction between the normal and the pathological, various notions of life ranging from the biological to the political perspective, and liberal eugenics and enhancements.

Svenaeus, Fredrik. *The Hermeneutics of Medicine and the Phenomenology of Health: Steps Towards a Philosophy of Medical Practice*. 2d ed. Cham, Switzerland: Springer, 2022.

The author utilizes phenomenology to examine the practice of clinical medicine. To that end, he first examines the clinical encounter, including the social and cultural context of the patient-physician relationship. Next, he addresses health and illness from a phenomenological, especially Heideggerian, perspective, in which health is compared to homelikeness and illness to unhomelikeness. Finally, he explores the hermeneutics of medicine, using the work of Gadamer and Ricoeur, as well as the hermeneutics of medical ethics.

Toombs, S. Kay, ed. *Handbook of Phenomenology and Medicine*. Philosophy and Medicine 68. New York: Springer, 2001.

The aim of the collection of essays is to explore the importance of the phenomenological perspective for modern medicine, especially in the United States. To that end, the essays are divided into six sections. The first contains essays on the phenomenological perspective toward medicine itself, while the next two sections contain essays on embodiment and the lived experience vis-à-vis illness. Essays in the remaining three sections examine the phenomenological perspective toward clinical practice, medical ethics, and clinical research.

Zaner, Richard M. *The Context of Self: A Phenomenological Inquiry Using Medicine as a Clue*. Athens, OH: Ohio University Press, 1981.

Based on Hans Jonas's phenomenological analysis of life and embodiment, the author examines the notion of embodiment and what it means for a robust practice of medicine. To that end, he develops a phenomenological notion of the self and uses it to assess diseases, such as autism and terminal illness. He concludes by using the notion to assess various diseases, such as autism and terminal illness.

Feminism and Gender Medicine

Women have always been second-class citizens in the Western patriarchal society, and medicine is no different. Nelson 2015 recounts the role of feminism in terms of reproductive rights during the latter half of the twentieth century in the United States. Peters, et al. 2016 charts the shift from reproductive rights to the global issues with respect to noncommunicable diseases facing women today. Shai, et al. 2021 analyzes gender medicine from a feminist lens to correct the neglect of women's voices in health care. Zeiler and Käll 2014 explores the impact of feminist phenomenology on medicine and its practice. Feminist thought has also been instrumental in the emergence of gender medicine (Lippi, et al. 2020). Watts 2016 examines gender medicine in terms of the experiences of both women and men in receiving and providing health care, while Glezerman 2016 discusses the impact of recent scientific advances on gender medicine. Gideon 2016 is a comprehensive handbook on both gender and health.

Gideon, Jasmine, ed. *Handbook on Gender and Health*. Cheltenham, UK, and Northampton, MA: Edward Elgar, 2016.

The handbook is composed of eight parts with over thirty chapters. After the editor's introductory chapter on gender and health, the next three parts discuss the impact of public policies, working conditions, and migratory patterns on health vis-à-vis gender. The fifth part looks specifically at the intersection of gender and health systems, while the next two parts look at the impact of households and social activism on health. The final part covers the rights associated with sexuality.

Glezerman, Marek. *Gender Medicine: The Groundbreaking New Science of Gender- and Sex-related Diagnosis and Treatment*. New York: Overlook, 2016.

The author canvases the recent scientific developments associated with gender medicine, especially as they are concerned with differences in biological sex derived from human evolution. The topics covered range from traditional reproductive physiology to pain. In several chapters, the author explores the biological male as the weaker sex and as an endangered species. He concludes with the future of gender medicine and how best to promote it.

Lippi, Donatella, Raffaella Bianucci, and Simon Donell. "Gender Medicine: Its historical Roots." *Postgraduate Medical Journal* 96.1138 (2020): 480–486.

The authors identify the development of gender medicine citing the publication of the Yentl Syndrome in which female heart attacks are symptomatically different from male heart attacks. They then explore the history behind gender biases in medical practice and research. They conclude with the current state of gender medicine, especially in terms of including women's voices in enhancing the quality of health care for women.

Nelson, Jennifer. *More than Medicine: A History of the Feminist Women's Health Movement*. New York: New York University Press, 2015.

After introducing the issues that plague women's health care, especially in terms of reproductive rights, the author recounts the historical changes associated with the women's health movement and activists specifically in the United States during the 1960s. She then recounts the founding of the Aradia Women's Health Center in the early 1970s and concludes with reconstructing the historical events around reproductive justice for women of color in the South.

Peters, Sanne A. E., Mark Woodward, Vivekanand Jha, Stephen Kennedy, and Robyn Norton. "Women's Health: A New Global Agenda." *BMJ Global Health* 1.3 (2016): e000080.

The authors chart the shift from the issues of reproductive rights in the latter part of the twentieth century to those of noncommunicable diseases, such as cardiovascular diseases and depression, that face women globally in the twenty-first century. They claim that women's health needs to be redefined in terms of noncommunicable diseases and that reproductive health is intimately tethered to overall health.

Shai, Ayelet, Shahar Koffler, and Yael Hashiloni-Dolev. "Feminism, Gender Medicine and Beyond: A Feminist Analysis of 'Gender Medicine.'" *International Journal for Equity in Health* 20.1 (2021): 177.

According to the authors, the feminist movement has had a profound impact on the rise of gender medicine and on the founding of the International Society for Gender Medicine in 2006. Disturbingly, however, the authors found that often physicians who practice gender medicine neglect the voices of female patients. They propose an approach to gender medicine that integrates feminist thinking to correct this neglect.

Watts, Jacqueline H. *Gender, Health and Healthcare: Women's and Men's Experience of Health and Working in Healthcare Roles*. London: Routledge, 2016.

The author explores not only the role of gender in receiving health care but also with respect to providing it. To that end, she employs a social constructionist perspective to analyze the impact of social norms about gender on the nature of health and the provision of health care. She concludes that care should be prioritized over cure when it comes to receiving and delivering quality health care that meets the individual's needs.

Zeiler, Kristin, and Lisa Folkmarson Käll, eds. *Feminist Phenomenology and Medicine*. Albany: State University of New York Press, 2014.

The essays in this volume provide insights into medical practices from a feminist phenomenological perspective to address issues facing health care for women, from dentistry and organ transplants to midwifery and psychiatry. As the editors note in their introduction, this perspective relies on both embodiment and the lived experience not only of women but also others marginalized in society to provide quality individual health care.

Biopsychosocial Medicine

Biopsychosocial (BPS) medicine is, in part, a response to the overreliance of medicine on technology and science to treat disease, often resulting in the marginalization or even exclusion of the patient (Engel 1977). Frankel, et al. 2003 and Borrell-Carrió, et al. 2004 explore not only the history of BPS medicine and its present implementation in the clinic, but also its future in health care. In contrast, Ghaemi 2010 examines the failure of the BPS model and proposes an alternative to it, while Gask 2018 defends it. Bolton and Gillett 2019 is a more recent attempt to revise the BPS model by updating it with contemporary biomedicine, psychology, and sociology. Similarly, Smith 2021 also strives to update the model scientifically. Williamson 2022 is a plea to revise the model for its clinical implementation.

Bolton, Derek, and Grant Gillett. *The Biopsychosocial Model of Health and Disease: New Philosophical and Scientific Developments*. Cham, Switzerland: Palgrave Pivot, 2019.

The authors' goal is "to articulate a clear biopsychosocial model, drawing on Engel's original, but updating it in the light of substantial developments in the sciences and philosophy in the past few decades" (p. v). To that end, they begin with a chapter canvasing the history of the model and identify various criticisms of the model but defend the need for a general model. In the remaining chapters, they revise the model in terms of contemporary biomedicine, psychology, and sociology.

Borrell-Carrió, Francesc, Anthony L. Suchman, and Ronald M. Epstein. "The Biopsychosocial Model 25 Years Later: Principles, Practice, and Scientific Inquiry." *Annals of Family Medicine* 2.6 (2004): 576–582.

The authors defend the BPS model and its practical application to clinical medicine by making three clarifications: "(1) the relationship between mental and physical aspects of health is complex—subjective experience depends on but is not reducible to laws of physiology; (2) models of circular causality must be tempered by linear approximations when considering treatment options; and (3) promoting a more participatory clinician-patient relationship is in keeping with current Western cultural tendencies, but may not be universally accepted" (p. 576).

Engel, George L. "The Need for a New Medical Model: A Challenge for Biomedicine." *Science* 196.4286 (1977): 129–136.

In this well-known and influential article, with over eighteen thousand citations (according to Google Scholar), the author proposes a BPS model to replace the traditional biomedical model, with its emphasis on pathophysiology. Specifically, he claims that the proposed model—based on Bertalanffy's General Systems Theory—"provides a blueprint for research, a framework for teaching, and a design for action in the real world of health care" (abstract).

Frankel, Richard M., Timothy E. Quill, and Susan H. McDaniel, eds. *The Biopsychosocial Approach: Past, Present, and Future*. Rochester, NY: University of Rochester Press, 2003.

In this book, issues surrounding the implementation and practice of the BPS model for medicine are addressed. Topics include its clinical application, its role in clinical research, medical administration and education in terms of the model, and the historical and philosophical context. Besides providing an introductory essay, the editors also provide a final essay on the future of the BPS model for clinical practice.

Gask, Linda. "In Defence of the Biopsychosocial Model." *The Lancet Psychiatry* 5.7 (2018): 548–549.

The author defends Engel's BPS model by stressing its reliance on systems theory. Specifically, mental disorders pertain not simply to the sub-personal physical components but also to how they are embedded in the suprapersonal psychological and social components. "If psychiatry's account of the nature of mental disorders only referred to the sub-personal, that is the biomedical model," as the author warns, "the profession would not only be viewed as reductionist in its explanations of human experience, but also as dehumanizing" (p. 548).

Ghaemi, S. Nassir. *The Rise and Fall of the Biopsychosocial Model: Reconciling Art and Science in Psychiatry*. Baltimore: Johns Hopkins University Press, 2010.

The author provides a probing historical and philosophical analysis of the ascendency of the BPS model and its eventual failure to deliver the care promised initially. Specifically, the author's criticism is that the model "gives mental health professionals permission to do everything but no specific guidance to do anything" (p. 82). He then proposes an alternative model that incorporates the art of medicine with an evidence-based approach.

Smith, Robert C. "Making the Biopsychosocial Model More Scientific—Its General and Specific Models." *Social Science & Medicine* 272 (2021): 113568.

To make the BPS model more scientific, the author distinguishes between general and specific models. The general model pertains to the macro or populational level, while the specific model pertains to the micro or individual patient level. The specific model engages in patient-centered interviewing to obtain particular and relevant data on the patient. Consequently, the specific model is akin to evidence-based medicine and, when joined with evidence from the general model, yields a fully scientific model.

Williamson, Simon. "The Biopsychosocial Model: Not Dead, but in Need of Revival." *BJPsych Bulletin* 46.4 (2022): 232–234.

The author acknowledges that Engel's BPS model—or his preferred term paradigm—faces several importance challenges, such as philosophical coherence in terms of causation or practical and theoretical usefulness, as well as challenges with respect to its clinical implementation. However, he is optimistic that the model is important for the future, particularly for psychiatry, in that the Royal College of Psychiatrists positioned the model at the center of its Core Values Framework.

Narrative Medicine

With the inception and use of the stethoscope, the patient's story was slowly marginalized—if not excluded—from clinical diagnosis, as it came to be seen as subjective and unreliable. Although objective clinical facts are important for arriving at an accurate diagnosis, they are insufficient—particularly from the patient's perspective—for providing comprehensive medical care. Tantamount to providing such care is an inclusion of the patient's narrative of the illness experience and the impact of the illness on his or her life. Kleinman 1988 is the classical introduction of narrative medicine into clinical practice. Mehl-Madrona 2007 and Robertson and Clegg 2016 explore the therapeutic power of narrative in the healing relationship. Stories are the focal point of narrative medicine, and Hunter 1991 examines medical knowledge in terms of doctors' stories, while Brody 2003 focuses on patients' stories. Charon, et al. 2017 examines the operating principles of narrative medicine within the clinic. Meza and Passerman 2011 proposes the integration of narrative medicine with evidence-based medicine, and Marini 2016 extends that integration to include the medical humanities.

Brody, Howard. *Stories of Sickness*. 2d ed. New York: Oxford University Press, 2003.

First published in 1987, the author examines the nature of narrative medicine based on the types of stories patients tell and the impact illness, as well as disability, has on the daily life of patients. He also explores the role of sickness on social relations and the nature and practice of narrative ethics. He concludes discussing the narrative nature of the healing relationship.

Charon, Rita, Sayantani Dasgupta, Nellie Hermann, et al. *The Principles and Practice of Narrative Medicine*. New York: Oxford University Press, 2017.

The coauthors (eight in all) introduce the principles of narrative medicine and their importance in the practice of clinical medicine, as it has progressed, especially at Columbia University Medical Center, from its inception. After an introduction by the lead author, individual authors explore a range of principles that govern the practice of narrative medicine in terms of intersubjectivity, personhood, creativity, and qualitative knowledge.

Hunter, Kathryn M. *Doctor's Stories: The Narrative Structure of Medical Knowledge*. Princeton, NJ: Princeton University Press, 1991.

The book's main thesis is that medicine is an art or an interpretative profession, in addition to being a science, and thus depends heavily upon the patient's illness story. The author first introduces the reader to the nature of interpretation and its role in medicine, and then she discusses a number of issues involved in the practice of narrative medicine from the clinical perspective.

Kleinman, Arthur. *The Illness Narratives: Suffering, Healing and the Human Condition*. New York: Basic Books, 1988.

The book is a landmark in the narrative medicine literature, with over ten thousand citations, according to Google Scholar. Drawing on myriad clinical cases, the author argues for the inclusion of the patient's story into the treatment and management of chronic diseases. To that end, he examines the meaning of illness for both the individual patient and society, and thereby introduces a method of care for treating the chronically ill.

Marini, Maria Giulia. *Narrative Medicine: Bridging the Gap between Evidence-Based Care and Medical Humanities*. Cham, Switzerland: Springer, 2016.

The author's main goal is to use narrative medicine to reconcile the divide that exists between evidence-based medicine and humane medicine in order to provide quality health care. To that end, she confronts the contemporary medical Tower of Babel in which the clinician and patient are often incapable of communicating meaningfully with one another towards constructing a therapeutic relationship. She concludes by providing examples of medical narratives from hematology to neurology.

Mehl-Madrona, Lewis. *Narrative Medicine: The Use of History and Story in the Healing Process*. Rochester, VT: Bear & Company, 2007.

The author acknowledges that patients are composed of physical material, as expounded by Western contemporary medicine, but at heart they are comprised of their stories, which reflect their culture. Drawing upon not only the patient's narrative but also the cultural narrative, especially of indigenous culture globally, he explores the power of narrative in "talking' with chronic diseases such as asthma, cancer, and mental illness. The author concludes with strategizing to revise the larger health-care narrative.

Meza, James P., and Daniel S. Passerman. *Integrating Narrative Medicine and Evidence-Based Medicine: The Everyday Social Practice of Healing*. London: Radcliffe, 2011.

The book addresses the philosophical issues involved in integrating evidence-based and narrative medicine. It is practical initially in its approach to the integration, beginning with the incorporation of the patient's illness narrative into diagnosis and then into the best therapy for the patient. It subsequently turns to theoretical issues involved in integrating evidence-based and narrative medicine, particular the nature of medical professionalism.

Robertson, Colin, and Gareth Clegg, eds. *Storytelling in Medicine: How Narrative Can Improve Practice*. Boca Raton, FL: CRC, 2016.

The editors open this collection of essays with one of the chief complaints of patients, "Nobody listened to my story." To address that chief complaint, a series of essays follow beginning with an introduction to the power of the narrated story, particularly in the patient-clinician consultation. But it is not only that story that is addressed but also the stories of children, the dying, doctors, medical students, and even hospitals.

Virtue Medicine

With the rise of modern contemporary society, beginning with the scientific revolution of the seventeenth century, deontological and consequentialist ethics eclipsed traditional virtue ethics. However, during the twentieth century, virtue ethics reemerged and was eventually appropriated to the clinic. The entries listed below examine the philosophical issues pertaining to the role of virtues, especially the cardinal and theological virtues, in medicine. Pellegrino and Thomasma 1993 provides a systematic operationalization of virtue theory to clinical practice, while Pellegrino and Thomasma 1996 extends the authors' earlier work to include the theological virtues and propose a notion of a Christian personalist physician. Bryan 2005 and Leffel, et al. 2018 explore the role of virtues in the daily practice of medicine, and Peteet 2022 and Radden and Sadler 2010 focus specifically on psychiatry. Marcum 2012 develops a notion of a virtuous physician to address the quality of care and professionalism crises in medicine. Interestingly, Kotzee, et al. 2017 reports on a survey of medical students and physicians in which they identified the virtues for good clinical practice.

Bryan, C. S. "Medicine and the Seven Basic Virtues." *Journal of the South Carolina Medical Association* 101.9 (2005): 327–328.

The article is an editorial introduction to a series of seven additional articles, published over two years in the journal, on the practical application of the virtues—prudence, justice, temperance, courage, faith, hope, and love—to the practice of clinical medicine. The author concluded the series with a final article summing up his application of the virtues to clinical practice.

Kotzee, Ben, Agnieszka Ignatowicz, and Hywel Thomas. "Virtue in Medical Practice: An Exploratory Study." *HEC Forum* 29 (2017): 1–19.

After acknowledging the role of virtues in medicine, the authors note that no empirical studies have been conducted to determine which virtues physicians embrace and how these virtues function in a physician's moral character vis-à-vis clinical practice. To that end, they

report a survey of three medical schools in the United Kingdom in which medical students and physicians identified virtues important for clinical practice, especially in terms of addressing ethical dilemmas.

Leffel, G. Michael, Ross A. Oakes Mueller, Sandra A. Ham, Kyle E. Karches, Farr A. Curlin, and John D. Yoon. "Project on the Good Physician: Further Evidence for the Validity of a Moral Intuitionist Model of Virtuous Caring." *Teaching and Learning in Medicine* 30.3 (2018): 303–316.

A report on the "Project of the Good Physician" at the University of Chicago, which is based on a moral intuitionist model of virtuous caring. The virtues upon which the program operates include empathetic compassion, generosity, and mindfulness. Based on data collected from a sample of medical students who expressed these virtues, the author reported that the students were viewed by their peers as "exemplary doctors."

Marcum, James A. *The Virtuous Physician: The Role of Virtue in Medicine*. Philosophy and Medicine 114. New York: Springer, 2012.

The author contextualizes the need for virtues in the practice of medicine with two crises facing modern medicine—quality of care and professionalism. Using the four cardinal virtues and three theological virtues as focal virtues about which to structure cognate virtues, the author argues that virtues are beneficial for practicing medicine and for forming a therapeutic patient-physician relationship, and can thus help resolve the two crises facing contemporary medicine.

Pellegrino, Edmund D., and David C. Thomasma. *The Virtues in Medical Practice*. New York: Oxford University Press, 1993.

The authors explore the general role of virtues in medical practice, especially as a moral practice. Specifically, they examine the relevance of fidelity, trust, compassion, phronesis, justice, fortitude, temperance, integrity, and self-effacement to clinical practice. They also discuss whether virtues make a difference in the delivery of health care, and whether virtues can be taught, concluding with an analysis of virtues in philosophy of medicine.

Pellegrino, Edmund D., and David C. Thomasma. *The Christian Virtues in Medical Practice*. Washington, DC: Georgetown University Press, 1996.

In this sequel to their 1993 book, the authors examine specifically the theological virtues, including faith, hope, and charity, associated with the Christian virtuous physician. They explore the role of religious commitments in clinical judgment and the relationship between Christian virtues and the principles of autonomy, beneficence, and justice. They also introduce the notion of a Christian personalist physician, who embodies the theological virtues.

Peteet, John R., ed. *The Virtues in Psychiatric Practice*. New York: Oxford University Press, 2022.

The edited collection of essays explores the role of virtues in psychiatry. The goal of the edited volume is to explore the need for virtues in psychiatric practice. To that end, the dozen essays are divided into four sections. The first examines the virtues of self-control, while the second the virtues of benevolence. The last two sections discuss the virtues of intelligence and positivity, respectively. The volume concludes with future directions in terms of human flourishing.

Radden, Jennifer, and John Sadler. *The Virtuous Psychiatrist: Character Ethics in Psychiatric Practice*. New York: Oxford University Press, 2010.

One of the foundations upon which the authors base the book is "the belief that the emphasis on character and moral psychology in a virtue theory significantly augments our understanding of the ethical demands of psychiatric practice" (p. 3). To that end, they unpack the notion of the virtuous psychiatrist in terms of the virtues required for virtuous practice and provide vivid case studies to illustrate such practice.

Patient-Centered Medicine

Patient-centered medicine represents a movement to provide quality health care in a practice often dominated by biomedical evidence. Balint 1969 introduces the term "patient-centered medicine," while Mead and Bower 2000 explores its clinical application. Stewart, et al. 2014 discusses the operating principles of patient-centered medicine. Rosen and Hoang 2017 and Sullivan 2017 explore the role of human experience and agency in patient-centered medicine. Epstein, et al. 2005 provides an empirical analysis of patient-centered outcomes. Frampton and Charmel 2009 is a practical exposition on patient-centered care in terms of the Planetree philosophy of health care. Lastly, Bardes 2012 identifies a flaw in the notion of patient-centeredness and proposes more apt metaphors.

Balint, Enid. "The Possibilities of Patient-Centered Medicine." *The Journal of the Royal College of General Practitioners* 17.82 (1969): 269–276.

In contrast to an "illness-oriented medicine," the author introduces "patient-centered medicine" as clinical practice in which not only is the diagnosis localized to the disease's location, but also includes an "overall diagnosis" that factors in the patient's illness experience. She goes on to discuss the formation of a group of practitioners who meet to analyze various clinical cases from a patient-oriented perspective, which eventually led to "Balint groups."

Bardes, Charles L. "Defining 'Patient-Centered Medicine.'" *New England Journal of Medicine* 366.9 (2012): 782–783.

The author argues that patient-centered medicine represents a flawed metaphor. The flaw is that neither the patient nor the physician is the "center" of care. Rather, both bring important elements to the therapeutic relationship, which, in his words, "relies on collaboration between the patient and the doctor" (p. 783). More apt metaphors, he contends, are a pair of binary stars, a double helix, or a caduceus.

Epstein, Ronald M., Peter Franks, Kevin Fiscella, et al. "Measuring Patient-Centered Communication in Patient-Physician Consultations: Theoretical and Practical Issues." *Social Science & Medicine* 61.7 (2005): 1516–1528.

The authors discuss the philosophical and empirical issues facing the measurement of patient-centered care on clinical outcomes. Specifically, they identify three core values that inform patient centeredness, including patient preferences, participation, and partnership. Based on these values, they go on to emphasize the role of patient-centered communication (PCC) in achieving quality patient-centered care. To that end, the authors propose nine areas for implementing PCC, ranging from defining PCC clearly to measuring it precisely.

Frampton, Susan B., and Patrick A. Charmel, eds. *Putting Patients First: Best Practices in Patient-Centered Care*. 2d ed. San Francisco: Jossey-Bass, 2009.

The collection of essays is based on the Planetree philosophy of patient-centered health care, which was founded by Angelica Thieriot in response to her hospitalization from an acute illness. The topics covered range from issues surrounding patient-centered care and the formation of healing partnerships to practical issues concerning diet and healthful lifestyles of individuals and communities, as well as current trends in patient-centered care with respect to business practices and public policy.

Mead, Nicola, and Peter Bower. "Patient-Centredness: A Conceptual Framework and Review of the Empirical Literature." *Social Science & Medicine* 51.7 (2000): 1087–1110.

The authors provide an insightful review of the literature on the nature of patient-centered medicine, along with a conceptual framework in terms of its clinical practice. They go on to identify five dimensions important for its practice, including patient-as-person, doctor-as-person, sharing power, therapeutic alliance, and biopsychosocial perspective. They also review empirical evidence and measurement techniques, and make several recommendations for improving patient-centered care.

Rosen, David H., and Uyen B. Hoang. *Patient-Centered Medicine: A Human Experience*. New York: Oxford University Press, 2017.

After introducing the practice of medicine as a "human experience," the authors draw upon George Engel's biopsychosocial model of medicine (the next two chapters represent reproduction of Engel's relevant articles) to forge a patient-centered medicine. To that end, they discuss the patient-physician relationship and its role in the patient-centered interview. The authors conclude with the patient's illness experience, especially in the hospital setting, and the notion of healing vis-à-vis patient-centered care.

Stewart, Moira, Judith B. Brown, W. Wayne Weston, Ian R. McWhinney, Carol L. McWilliam, and Thomas R. Freeman, eds. *Patient-Centered Medicine: Transforming the Clinical Method*. 3d ed. Boca Raton, FL: CRC, 2014.

First published in 1995, the edited volume is the standard textbook for introducing the fundamental ideas and principles of patient-centered medicine. After reconstructing its contemporary history, the authors identify four components comprising the patient-centered clinical method. The components consist of exploring the patient's illness experience, understanding the whole person, establishing common ground between patient and clinician, and enhancing the patient-clinician relationship. The volume concludes with the pedagogy of patient-centered medicine and its role in clinical research.

Sullivan, Mark D. *The Patient as Agent of Health and Health Care: Autonomy in Patient-Centered Care for Chronic Conditions*. New York: Oxford University Press, 2017.

The author claims that traditional medicine has failed to provide the necessary care for patients suffering from chronic diseases, which has led to a crisis in health care. He argues that patient-centered medicine, which envisions health care as "perceived and produced by patients" (p. 143), as the means for addressing that crisis. To that end, patients must be empowered as autonomous agents to fashion their own therapeutic strategies.

Complementary and Alternative Medicine

Complementary and alternative medicine (CAM) burst upon the health-care scene in Western industrialized countries during the latter part of the twentieth century (Coulter and Willis 2004). Micozzi 2019 provides a general introduction to CAM. And CAM's relationship to biomedicine is an important topic of discussion in the literature in terms of its contrast to biomedicine (Derkatch 2016, Louhiala 2017) and its integration with biomedicine to treat especially chronic diseases (Cooper and Yamaguchi 2004; Heller, et al. 2005). Additionally, what drives CAM is a medical pluralism and, to a large extent, the inability of Western medicine to deliver the holistic and humane care patients are often seeking (Drew 2021, Kelner and Wellman 2003).

Cooper, Edwin L., and Nobuo Yamaguchi, eds. *Complementary and Alternative Approaches to Biomedicine*. New York: Springer, 2004.

The collection of essays is divided into six sections. After introducing evidence-based CAM and its need globally, the first section explores various national practices of CAM. The next section contains essays on CAM approaches to a variety of diseases, while the following two sections examine acupuncture, hydrotherapy, music therapy, and dietary therapies. The penultimate section contains essays on therapeutic agents from earthworms, sponges, and various marine invertebrates, while the final section takes up CAM in terms of education and philosophy.

Coulter, Ian D., and Evan M. Willis. "The Rise and Rise of Complementary and Alternative Medicine: A Sociological Perspective." *Medical Journal of Australia* 180.11 (2004): 587–589.

The authors explore from a sociological perspective the rise of the CAM "craze" within the Western industrialized nations, especially Australia. One of the major driving forces for CAM's rise is the politicization of health with respect to individuals being empowered to make informed decisions concerning their own health rather than to rely strictly on traditional biomedicine. The authors conclude with the challenges facing CAM, particularly in terms of CAM providing evidence comparable to biomedicine.

Derkatch, Colleen. *Bounding Biomedicine: Evidence and Rhetoric in the New Science of Alternative Medicine*. Chicago: University of Chicago Press, 2016.

The author explores the rhetorical devices involved in the debate over evidence for CAM vis-à-vis the dominant field of biomedicine. To that end, she examines the demand of CAM services by patients in the United States during the 1990s. Specifically, she investigates how evidence-based practice was used to police the boundaries not only of traditional biomedicine but more importantly CAM practices to maintain its hegemonic control over medical care.

Drew, Kevin. *Complementary and Alternative Medicine: Containing and Expanding Therapeutic Possibilities*. New York: Routledge, 2021.

The author conducts a sociological analysis of CAM across global institutions and their therapeutic spaces, especially as confronted by traditional Western medicine as enforced by state sanctions. After introducing the challenges facing a consensus definition of CAM in terms of its therapeutic pluralism, the author dives into how CAM is practiced and regulated in Anglophone countries before turning to its practice in China and India. He explores CAM treatment of cancer before concluding about possibilities of hybridizing CAM and biomedicine.

Heller, Tom, Geraldine Lee-Treweek, Jeanne Katz, Julie Stone, and Sue Spurr, eds. *Perspectives on Complementary and Alternative Medicine*. Abingdon, UK: Routledge, 2005.

The essays examine the changing perspectives of the public toward CAM and the cultural and social issues associated with that change. The issues range from the motivations for the rise in CAM to its integration into traditional biomedicine. The essays are divided into three sections, with the first section examining the classification of CAM therapies and CAM's historical and political context. The next section explores the public's use of CAM, while the final section the various settings of CAM's use.

Kelner, Merrijoy, and Beverly Wellman, eds. *Complementary and Alternative Medicine: Challenge and Change*. London and New York: Routledge, 2003.

The collection of essays examines CAM's impact on contemporary health care. The essays are divided into four sections. The first addresses the question of "Why CAM Now?" and presents several answers including emphasis on bodily health and problems with biomedical therapeutic relationship. The next section canvases the users of CAM, while the following section explores the research and evidence-base of CAM. The final section discusses CAM's future, particularly in terms of medical pluralism, politics of CAM, and integrative health reform.

Louhiala, Pekka. "Complementary and Alternative Medicine (CAM) and Its Relationship to Western Medicine." In *Handbook of the Philosophy of Medicine*. Edited by Thomas Schramme and Steven Edwards, 927–936. Dordrecht, The Netherlands: Springer, 2017.

The author introduces CAM as a hybrid of complementary medicine and alternative medicine and discusses its relationship to Western medicine. She claims it is a "residual category" for classifying therapies mainly excluded from scientific medicine and its pedagogy. Indeed, she concludes that although CAM might be useful for political or sociological agendas, in the end there is only a single medicine vis-à-vis science.

Micozzi, Marc S. *Fundamentals of Complementary and Alternative Medicine*. 6th ed. Saint Louis, MO: Elsevier Health Sciences, 2019.

The book represents a comprehensive introduction of CAM and is divided into eight sections, with the first exploring the foundations of CAM in terms of themes and concepts. The next section covers CAM's fundamental sciences, ranging from quantum biology to mind-body physiology. The next three sections discuss CAM modalities, including mind-body, bodywork and manual, electromagnetic, naturopathic, homeopathic, osteopathic, and nutritional therapies. The final three sections explore the CAM's geographic locations across the globe.

Integrative Medicine

Integrative medicine's origin is closely associated with complementary and alternative medicine, as both Chopra 2000 and Weil 2004 illustrate. However, Baer 2004 advocates reintegrating traditional biomedicine with complementary and alternative medicine, and Kotsirilos, et al. 2011 examines the role of evidence in integrative medicine. Kligler and Lee 2004 and Rakel and Minichiello 2023 explore the application of integrative medicine to the clinic, while Bauer 2017 provides Mayo's clinical guide for practicing integrative medicine. Schneider and Seetharaman 2022 examines the future of integrative medicine.

Baer, Hans A. *Toward an Integrative Medicine: Merging Alternative Therapies with Biomedicine*. Walnut Creek, CA: AltaMira, 2004.

The author chronicles the rise of the holistic health movement and its legitimization and professionalization vis-à-vis traditional biomedicine. The movement's impact on the delivery of health care is also discussed, as are its two main advocates, Andrew Weil and Deepak Chopra. The author finally examines its potential for transforming medicine into a holistic health-care system and the barriers to that transformation.

Bauer, Brent A. *Mayo Clinic Guide to Integrative Medicine*. Rochester, MN: Mayo Clinic, 2017.

The clinical guide is an introduction to integrative medicine for achieving and maintaining wellness. The guide begins with an introduction to the notion of integrative medicine and then proceeds to explore various practices, such as exercise and nutrition, to achieve wellness. Experts from the Mayo Clinic in various fields of integrative medicine contribute to various techniques, including relaxation, meditation, guided imagery, acupuncture, herbs, massage therapy, and spirituality, to treat a variety of common health conditions.

Chopra, Deepak. *Perfect Health: The Complete Mind Body Guide*. Rev. ed. New York: Three Rivers, 2000.

Originally published in 1991, the book represents a popular approach to the integration of contemporary medical sciences with alternative approaches, particularly with Indian Ayurveda medicine. After introducing the notion of "perfect health," the author proposes the notion of "quantum medicine" and its therapeutic use. He concludes with practical diets and physical exercises for developing and maintaining perfect health in terms of living in accord with nature itself.

Kligler, Benjamin, and Roberta Lee, eds. *Integrative Medicine: Principles for Practice*. New York: McGraw-Hill Professional, 2004.

The edited volume is an introductory text to the principles of integrative medicine—traditional biomedicine and complementary and alternative medicine—relevant for the practice of medicine, especially primary care. The authors provide ample clinical vignettes to illustrate the application of these principles to clinical medicine. And the volume concludes by exploring legal and ethical issues and various cases illustrating the practice of integrative medicine.

Kotsirilos, Vicki, Luis Vitetta, and Avni Sali. *A Guide to Evidence-Based Integrative and Complementary Medicine*. Chatswood, Australia: Elsevier Australia, 2011.

As the authors note, the textbook provides an approach to "the non-pharmacological treatments for common medical practice problems, with the support of current scientific evidence" (p. viii). In other words, they are proposing an evidence-based integrative and complementary medicine. To that end, the textbook is divided into three parts. The first introduces integrative and complementary medicine, along with nutritional therapies, while the second discusses over thirty clinical problems. The final part examines precautions for practicing integrative and complementary medicine.

Rakel, David, and Vincent Minichiello, eds. *Integrative Medicine*. 5th ed. Philadelphia: Elsevier, 2023.

Originally published in 2003, this is a textbook on integrative medicine. An initial chapter, coauthored with Andrew Weil, presents an overview of the philosophy of integrative medicine. Topics range from the rise of integrative medicine to the nature of illness and therapeutic modalities, including a variety of practical topics for practicing integrative medicine, written by experts on those topics.

Schneider, Robert H., and Mahadevan Seetharaman, eds. *The Future of Medicine: Frontiers in Integrative Health and Medicine*. Basel, Switzerland: MDPI, 2022.

The edited volume represents a collection of fourteen articles originally published in the journal *Medicina* from 2020 to 2021. After an introductory article entitled "The Future of Medicine: Frontiers in Integrative Health and Medicine," the diversity of topics include the microbiome, epigenetics, transcriptomics, neurobiology of meditation, ayurgenomics, ayurvedic herbs and diets, plastic surgery, asthma, and even viral diseases such as COVID-19.

Weil, Andrew. *Health and Healing: The Philosophy of Integrative Medicine and Optimum Health*. Rev. ed. Boston: Houghton Mifflin, 2004.

First published in 1983, the book represents another popular approach to integrating complementary and alternative medicine into traditional Western medicine. Topics covered include the nature of health, curing and healing, the mind-body relationship, and both allopathic and homeopathic therapeutic modalities. The author concludes with a discussion of the future of integrative medicine in the twenty-first century and its role in optimizing health.

Medical Ontology

Traditionally, the most important topic for medical ontology—the metaphysical categorization of things that exist—is the notion of disease, which ranges from a naive realist position to full-blown constructivism. However, in recent years, the notion of health has emerged to eclipse disease's preeminence among philosophers of medicine. Causation is also an important topic for medical ontology, especially in terms of the etiology of disease and effective therapeutics.

Disease

The concept of disease and its definition are contentious issues in the medical and philosophical literature. The debate over the nature of disease often focuses on whether it is value-independent or value-dependent. In a highly influential article, Boorse 1975 rejects the value-dependent notion of disease, whereas Reznek 1987 defends it. Still other works, such as Kingma 2017 and Powell and Scarffe 2019, argue for an intermediate or a hybrid position. Sisti and Caplan 2017 and Smart 2016 provide recent discussions concerning the notion of disease, while Cooper 2017 contrasts it with the notion of health. Hofmann 2010 contends that the ambiguity surrounding the nature of disease is not detrimental to clinical practice.

Boorse, Christopher. "On the Distinction between Disease and Illness." *Philosophy & Public Affairs* 5.1 (1975): 49–68.

The article is a very influential, if not a classic, depiction of the nature and distinction between disease and illness, with over fifteen hundred citations on Google Scholar. According to the author, disease is strictly biological and defined vis-à-vis health as an "unhealthy condition." Illness, in contrast, is a subclass of diseases that requires medical intervention. The author uses mental illness as an example to illustrate the distinction between disease and illness.

Cooper, Rachel. "Health and Disease." In *The Bloomsbury Companion to Contemporary Philosophy of Medicine*. Edited by James A. Marcum, 275–296. London: Bloomsbury, 2017.

The author acknowledges the challenges facing the explanation of the concept of disease, especially as it relates to the concept of health. She begins by situating the essay within the history of the debate over what constitutes the concept of disease, particularly as to whether it is simply a dysfunction of normal physiological or psychological functioning. She then goes on to discuss current attempts to explain disease, including mental disorders.

Hofmann, Bjørn. "The Concept of Disease—Vague, Complex, or Just Indefinable?" *Medicine, Health Care and Philosophy* 13.1 (2010): 3–10.

The author examines the claims within the medical literature that conceptions of disease are too vague, ambiguous, and complex, and thereby the concept of disease itself is thereby indefinable and basically unnecessary for clinical practice. After reviewing the literature, he concludes that these claims, although problematic, are not fatal for the usefulness of the concept of disease in the clinic.

Kingma, Elselijn. "Disease as Scientific and as Value-Laden Concept." In *Handbook of the Philosophy of Medicine*. Edited by Thomas Schramme and Steven Edwards, 45–63. New York: Springer, 2017.

The author notes that disease, as well as health, is a critical concept for establishing the boundaries of medicine and its practice. After recounting the debate between naturalist and normative concepts of disease, she proposes to move beyond the debate "to adopt a more nuanced perspective either by crafting a position in the middle, or by recognizing multiple dimensions of opposition, or by finding other ways of combining the insights from both camps" (p. 60).

Powell, Russell, and Eric Scarffe. "Rethinking 'Disease': A Fresh Diagnosis and a New Philosophical Treatment." *Journal of Medical Ethics* 45.9 (2019): 579–588.

After acknowledging the gridlock over the debate concerning the nature of disease, the authors propose "a meta-methodological critique guided by our pragmatic expectations of what the disease concept ought to do given that medical diagnosis is woven into a complex network of healthcare institutions" (p. 579). To that end, they develop a hybrid conception that is sensitive not only to the biomedical but also to the institutional dimensions of disease.

Reznek, Lawrie. *The Nature of Disease*. London: Routledge & Kegan Paul, 1987.

The author contends that philosophers cannot cure diseases, but that they can "cure inappropriate disease attributions" (p. 11). To that end, he argues that disease is not a natural kind, in terms of being a mind-independent object, but rather represents a value-dependent concept. Specifically, certain conditions are labeled disease before knowing the etiology. The operative notion is that of harm, which involves value judgment.

Sisti, Dominic, and Arthur L. Caplan. "The Concept of Disease." In *The Routledge Companion to Philosophy of Medicine*. Edited by Miriam Solomon, Jeremy R. Simon, and Harold Kincaid, 5–15. New York: Routledge, 2017.

The authors tackle straightforwardly the question, "What is disease?" After acknowledging that what constitutes disease is often ignored in the bioethics literature, they provide "historical thumbnails" before discussing contemporary concepts of disease. Although there are myriad concepts, they focus particularly on naturalism and normativism concepts of disease, including hybrid concepts. They conclude with a discussion of psychiatric nosology and its future.

Smart, Benjamin. *Concepts and Causes in the Philosophy of Disease*. Basingstoke, UK: Palgrave Macmillan, 2016.

The author explores the debate over the nature of disease, especially in terms of what it means for the practicing clinician. To that end, he divides the book into two parts. In the first, he examines the concept of disease as a pathological condition in terms of clinical medicine. In the second part, he explores disease causation with respect to its philosophical foundations.

Health

Although health, historically, has taken a backseat to disease, today it is front and center in the philosophy of medicine literature. As for the notions of disease, the distinction between the notions of health is also conceptualized along naturalistic or value-independent and

normative or value-dependent lines. Boorse 2014 defends a value-independent notion of health against critics such as Kingma 2007 who criticizes Boorse's notion as misleading. World Health Organization 2006 provides a widely quoted definition of health, while Huber, et al. 2011 and van Druten, et al. 2022 critique and expand the WHO definition. Based on the WHO definition, Nordenfelt 2017 proposes a notion of positive health. Leonardi 2018 also proposes a definition that extends the WHO definition, especially for clinical application. Carel and Cooper 2013 is a general overview of notions on health, especially as related to disease and illness.

Boorse, Christopher. "A Second Rebuttal on Health." *Journal of Medicine and Philosophy* 39.6 (2014): 683–724.

The author engages in a second round of defense (the first was in 1977) against criticism of his biostatistical theory of health, first proposed in 1970s. According to that theory, health is a value-free concept and represents the absence of pathological conditions. In other words, it is the normal functioning of an organism in terms of its species design or reference class. In the end, he remains unapologetic for his notion of health.

Carel, Havi, and Rachel Cooper, eds. *Health, Illness and Disease: Philosophical Essays*. Durham, UK: Acumen, 2013.

Essays explore the territory between health and disease with respect to organic pathology and the patient's lived experience. The nature of health and disease is examined in terms of naturalism, social constructivism, normativism, and holism. The experience of illness and its effect upon a patient's life-world is discussed, concluding with issues related to the intersection between health and illness vis-à-vis society, intersexuality, depression, and beauty.

Huber, Machteld, J. André Knottnerus, Lawrence Green, et al. "How Should We Define Health?" *British Medical Journal* 343 (2011): d4163.

A précis of a report derived from an international conference, "Is Health a State or an Ability? Towards a Dynamic Conception of Health," held in 2009 at The Hague. As an alternative definition to the WHO's definition of health, the conferences participants proposed the following rather general definition of health as "the ability to adapt and self manage."

Kingma, Elselijn. "What Is It to Be Healthy?" *Analysis* 67.2 (2007): 128–133.

Argues that Boorse's theory of health as a value-independent concept is misleading and, in the end, indefensible. The author's critique focuses on the notion of a reference class. What he contends is that the choice of a reference class does not depend strictly or exclusively on empirical facts but rather that choice ultimately depends on social and cultural values guiding the choice.

Leonardi, Fabio. "The Definition of Health: Towards New Perspectives." *International Journal of Health Services* 48.4 (2018): 735–748.

After analyzing philosophically several definitions of health articulated in the recent medical and scientific literature, the author proposes a definition that captures the nine practical, theoretical, and epistemological dimensions of health, especially in terms of addressing the challenges facing the WHO definition of health. He tersely defines health "as the capability to cope with and to manage one's own malaise and well-being conditions" (p. 742).

Nordenfelt, Lennart. "On Concepts of Positive Health." In *Handbook of the Philosophy of Medicine*. Edited by Thomas Schramme and Steven Edwards, 29–43. New York: Springer, 2017.

After the author rehearses the historical context for the various conceptions of health, he proposes a positive notion of health in contrast to a negative notion as simply the absence of disease, according to many naturalistic definitions. Specifically, he defines health as a culture-dependent notion with respect to well-being and ability, especially in terms of the WHO definition of health.

van Druten, Vera P., Edien A. Bartels, Dike van de Mheen, Esther de Vries, Angèle P. M. Kerckhoffs, and Lenny M. W. Nahar-van Venrooij. "Concepts of Health in Different Contexts: A Scoping Review." *BMC Health Services Research* 22.1 (2022): 389.

The authors claim that the WHO definition is no longer relevant to the context of contemporary health care and its organizations, providers, and consumers. To address this problem, they conducted a scoping review of the literature using the PRISMA-ScR guideline to analyze health definitions. Their conclusion is that health must take into consideration how health-care organizations, providers, and consumers define it.

World Health Organization. Constitution of the World Health Organization. Geneva, Switzerland: World Health Organization, 2006.

The framers of the constitution identified nine principles that "are basic to the happiness, harmonious relations and security of all peoples" (p. 1). The first principle is a definition of health. "Health," according to the WHO, "is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (p. 1). Since its proclamation, the definition has been quoted extensively and has formed the basis for various contemporary definitions of health.

Medical Causation

Although much of the causality literature in medicine pertains to the epidemiological and population level, a fair amount does wrestle with causality in disease mechanisms—especially at the molecular and cellular level. Probably the most celebrated literature on medical causation is for infectious and genetic diseases. For example, Dekkers and Rikkert 2006 investigates the notion of genetic causation, while Inglis 2007 critically examines Koch's postulates and modifies them. Russo and Williamson 2007 introduces an epistemic theory of causality that combines physical mechanisms and their probabilistic dependencies. And Illari and Russo 2014 and Kerry, et al. 2012 provide an overview of causal models in the biomedical sciences and evidence-based practice and research. Anjum, et al. 2020; Campaner 2012; and Reiss 2017 discuss the nature of medical causation from a larger framework, including complexity, evidence, probability, and explanation.

Anjum, Rani Lill, Samantha Copeland, and Elena Rocca, eds. *Rethinking Causality, Complexity and Evidence for the Unique Patient: A CauseHealth Resource for Healthcare Professionals and the Clinical Encounter*. Cham, Switzerland: Springer, 2020.

The outcome of an interdisciplinary project (2015–2019), CauseHealth, funded by a grant to the Norwegian University of Life Sciences. Essays target health-care professionals interested in exploring the philosophical issues associated with medical causality that have an impact on clinical practice. Essays are divided into two parts, with the first on a philosophical framework for exploring causality and the second on clinical application.

Campaner, Raffaella. *Philosophy of Medicine: Causality, Evidence and Explanation*. Bologna: ArchetipoLibri, 2012.

After introducing the development of the philosophy of medicine, the author discusses issues facing philosophers of medicine, such as understanding the nature of disease and scientific theories and laws. Her approach is to engage a multilevel analysis that depicts the complexities and uncertainties involved in medical science and its practice. The notions of mechanism, causation, reductionism, and explanation are analyzed, along with psychiatric diseases.

Dekkers, Wim, and Marcel Olde Rikkert. "What Is a Genetic Cause? The Example of Alzheimer's Disease." *Medicine, Health Care and Philosophy* 9.3 (2006): 273–284.

Examines the notion of genetic causation vis-à-vis disease etiology, especially with respect to a singular efficient cause. Uses Alzheimer's disease to motivate and illustrate their discussion. Concludes that although many diseases, including Alzheimer's, cannot be explained strictly by a single genetic agent, still such an approach does exhibit utility in explaining many diseases in a probabilistic and multifactorial manner.

Illari, Phyllis, and Federica Russo. *Causality: Philosophical Theory Meets Scientific Practice*. New York: Oxford University Press, 2014.

A comprehensive analysis of a roadmap is provided in this volume for understanding causation in the natural sciences, especially the biomedical sciences. After introducing the current problems associated with scientific causation, the authors launch into a discussion of the plurality of accounts for explaining causation. And in conclusion they propose a "mosaic" model, composed of causal theory tiles, to unify the pluralistic accounts of causation.

Inglis, Timothy J. J. "*Principia aetiologica*, Taking Causality beyond Koch's Postulates." *Journal of Medical Microbiology* 56.11 (2007): 1419–1422.

The author acknowledges that no consensus currently exists for establishing causal relationships between infectious agents and infectious diseases. To address the problem, he proposes a causal model that expands on the limitations inherent in Koch-Henle's postulates to include factors at different levels within an organism's interaction with its environment, particularly involving micro-organisms, and the impact of biomedical intervention upon that interaction.

Kerry, Roger, Thor Eirik Eriksen, Svein Anders Noer Lie, Stephen D. Mumford, and Rani Lill Anjum. "Causation and Evidence-Based Practice: An Ontological Review." *Journal of Evaluation in Clinical Practice* 18.5 (2012): 1006–1012.

An alternative model is proposed in contrast to the standard model of medical causation, with respect to evidence-based medicine. Based on an ontological notion of dispositionalism, the authors argue that causation is not limited or reducible to sequential cause-effect events but rather causation often represents highly complex and context-sensitive phenomena that are inclined toward effects both in terms of clinical application and research activity.

Reiss, Julian. "Causality and Causal Inference in Medicine." In *The Routledge Companion to Philosophy of Medicine*. Edited by Miriam Solomon, Jeremy R. Simon, and Harold Kincaid, 58–70. New York: Routledge, 2017.

The author delves into the philosophical issues involved in causality and causal inference in medicine and clinical practice and research. He certainly acknowledges the importance and usefulness of causality in understanding disease mechanisms and for developing pharmaceutical drugs to treat diseases. But as he points out and discusses throughout the essay, causality's usefulness depends on how reliably we can infer unambiguously causal relationships from data and then implement causal knowledge clinically.

Russo, Federica, and Jon Williamson. "Interpreting Causality in the Health Sciences." *International Studies in the Philosophy of Science* 21.2 (2007): 157–170.

According to the authors, causal monism and pluralism are inappropriate approaches for determining causal relationships in the health sciences. They then propose a theory of causality—an epistemic theory of causality—for these sciences in which both physical mechanisms and their probabilistic dependencies are combined "to capture the full complexity of causal evidence" (p. 169) in order to provide effective therapies and to formulate robust health policies.

Medical Epistemology

Medical epistemology initially relied on the philosophy of science and its positivist and empiricist approach to the discovery and justification of scientific knowledge. Traditionally, the growth of medical knowledge depends on technical advances within the basic and clinical sciences. In today's postgenomic age, the generation of large-scale datasets and the volume of patient data derived from clinical exams and laboratory tests have occasioned the development of medical informatics. Finally, clinical judgment and decision making represent an important topic for philosophers of medicine, since they are especially relevant for clinical practice and for providing quality health care.

Medical Knowledge and Explanation

Traditionally, the growth of medical knowledge depends upon the discovery process, whether in the basic or clinical sciences. Connected to that process is the rational or logical process of inferring and ultimately justifying this knowledge. The entries listed below represent this process in terms of its advantages and limitations. The process is critical for producing robust explanations in the biomedical sciences, which, in turn, make possible accurate diagnoses and effective therapeutic modalities in clinical practice (Solomon 2015). Nordenfelt and Lindahl 1984 examines the role of causal explanation is the growth of medical knowledge. Schaffner 1985 focuses on the role of discovery, especially in terms of diagnosis, in medical advancement. The question addressed in ten Have, et al. 1990 is whether progress in medicine is comparable to that in the natural sciences. And Thagard 1999 examines how medical scientists discover and explain the cause of disease. Lemoine 2017 explores the nature of medical explanation vis-à-vis scientific explanation, while Campaner 2022 examines the impact of explaining disease on medical research and practice. Stegenga 2018 argues for a gentler approach to medical knowledge and practice based upon a nihilistic stance.

Campaner, Raffaella. *Explaining Disease: Philosophical Reflections on Medical Research and Clinical Practice*. Cham, Switzerland: Springer, 2022.

Explores scientific and mechanistic models for explaining disease clinically, especially with respect to personalized and person-centered medicine. Also includes several case studies to examine the assumptions employed in the construction of explanatory models of diseases and their impact on clinical practice. Concludes with several reflections on the role of pluralistic attitudes and approaches for health care in general.

Lemoine, Mael. "Explanation in Medicine." In *The Routledge Companion to Philosophy of Medicine*. Edited by Miriam Solomon, Jeremy R. Simon, and Harold Kincaid, 296–309. New York: Routledge, 2017.

A major belief in the biomedical community is that evidence from clinical trials is sufficient to explain medical phenomena. The author examines this belief in terms of scientific explanations. To that end, she first explores the various types of scientific explanations, including deductive-nomological, statistical, and mechanistic explanations. Then, she turns to whether biomedical science simply models mechanisms or just establishes evidence with respect to medical explanations. She concludes that a coherence approach to medical explanation is the best approach.

Nordenfelt, Lennart, and B. Ingemar B. Lindahl, eds. *Health, Disease, and Causal Explanations in Medicine*. Proceedings of the Nordic Symposium on the Philosophy of Medicine held in Stockholm, 13–15 May 1982. Philosophy and Medicine 16. Dordrecht, The Netherlands: Kluwer, 1984.

Essays are the product of the first Nordic Symposium on the Philosophy of Medicine held in 1982. After a section of essays covering the nature of health and disease and another section of essays on the nature of medical definition and classification, the essays turn to medical causation and explanation, which constitutes well over half of the essays. Topics covered in this section range from the foundations of causal explanations to their application in the practice of medicine.

Schaffner, Kenneth F., ed. *Logic of Discovery and Diagnosis in Medicine*. Berkeley, CA: University of California Press, 1985.

Represents a collection of essays presented at workshop under the same title as the book, held at the University of Pittsburgh in 1978. As the editor notes in an introduction, the two themes yoking the essays are "problem solving" and "heuristic search." Topics such as diagnosis, discovery, clinical evaluation, and nosology, are introduced and discussed. Finally, the use of computers in clinical diagnosis is discussed.

Solomon, Miriam. *Making Medical Knowledge*. New York: Oxford University Press, 2015.

Proposes a pluralistic account to address the epistemological issues associated with the production of medical knowledge in terms of consensus conferences, evidence-based medicine, translational medicine, and narrative medicine. To that end, the author explores the

relationship between the art and science of medicine and then moves on to explore the various approaches to medical knowledge production such as evidence-based, translational, and narrative medicine. Concludes with a mammography case study illustrating the issues associated with medical pluralism.

Stegenga, Jacob. *Medical Nihilism*. New York: Oxford University Press, 2018.

Resurrects a rather controversial approach, medical nihilism, to medical knowledge and practice. Given the uncertainty or "malleability" of medical knowledge and explanation, the author proposes *la médicine douce*, or gentle medicine, in contrast to an aggressive medicine that is common within the health-care industry. He also addresses several criticisms of medical nihilism and concludes that the art of medicine should be founded on the "love of humanity"—somewhat reminiscent of Peabody 1927 (cited under Humanistic Medicine).

ten Have, Henk A. M. J., Gerrit K. Kimsma, and Stuart F. Spicker, eds. *The Growth of Medical Knowledge*. Philosophy and Medicine 36. Dordrecht, The Netherlands: Kluwer, 1990.

The question animating this book of essays is whether medicine progresses like that of the natural sciences—in terms of its knowledge base—and if so, how is it similar or different from these sciences. The question is addressed in terms of the historical trajectory of medicine's growth of knowledge, and of the philosophical, anthropological, and axiological problems associated with it.

Thagard, Paul. *How Scientists Explain Disease*. Princeton, NJ: Princeton University Press, 1999.

Explores how medical scientists discover and explain the cause of disease. Reconstructs the discovery of the role of bacteria in peptic ulcer and then uses it to illustrate how medical knowledge changes. Also discusses the cognitive processes involved in biomedical discoveries, including causation, correlation, analogies, and mechanisms, as well as the social processes involved in generating biomedical knowledge.

Medical Informatics

The rise of medical informatics is associated with the appearance of large-scale datasets from both basic and clinical research, as well as from patient data from clinical exams and laboratory tests (Collen and Ball 2015). Degoulet and Fieschi 1997 explores critical dimensions of clinical care that shape medical informatics, while Taylor 2006 discusses the principles associated with clinical practice based on health informatics. Kleinberg and Hripcsak 2011 reviews the nature of causal inferences in biomedical informatics, and Shortliffe and Cimino 2014 examines the technological and practical application of biomedical informatics to the clinic, while Frey, et al. 2016 discusses the role of medical informatics for practicing precision medicine. Hollis, et al. 2019 and Kumar, et al. 2021 delve into the impact of artificial intelligence, machine learning, and Internet of Things on medical informatics.

Collen, Morris F., and Marion J. Ball, eds. *The History of Medical Informatics in the United States*. 2d ed. London: Springer, 2015.

Provides a detailed and in-depth reconstruction of the development of medical informatics in the United States. Beginning with the introduction of digital computers, the creation of the disciple is covered in a second chapter. The remaining chapters are divided into two sections. The first contains chapters discussing the role of informatics in patient care, while the second explores support systems for implementing informatics clinically.

Degoulet, Patrice, and Marius Fieschi. "Critical Dimensions in Medical Informatics." *International Journal of Medical Informatics* 44.1 (1997): 21–26.

Identifies three crucial dimensions that shape and determine the field of medical informatics, including the level of care, the breadth of information and knowledge, and extent of society's computerization, are explored in this paper. Claims that the first dimension relies heavily on advances in medical and computer technology but that the greatest hurdles and barriers for the field are the last two dimensions.

Frey, Lewis J., Elmer V. Bernstam, and Joshua C. Denny. "Precision Medicine Informatics." In *Special Issue: Precision Medicine Informatics*. Edited by Lewis J. Frey, Elmer V. Bernstam, and Joshua C. Denny. *Journal of the American Medical Informatics Association* 23.4 (2016): 668–670.

This editorial introduces a special issue of the journal in response to the 2015 announcement of precision medicine. "The goal," as the authors report, "is to focus on the inherent translational informatics challenges, concerns, and opportunities afforded by precision medicine to provide an accurate, personalized characterization of patient populations based on various characteristics including molecular (e.g., genomic, proteomic), clinical (e.g., comorbidities), environmental exposures, lifestyle, patient preferences, and other information" (p. 668).

Hollis, Kate Fultz, Lina F. Soualmia, and Brigitte Séroussi. "Artificial Intelligence in Health Informatics: Hype or Reality?" In *Special Issue: Artificial Intelligence in Health; New Opportunities, Challenges, and Practical Implications*. Edited by Kate Fultz Hollis, Lina F. Soualmia, and Brigitte Séroussi. *Yearbook of Medical Informatics* 28.1 (2019): 3–4.

In this editorial to a special issue of the yearbook, the authors introduce the role of artificial intelligence in health informatics and comment on the various articles contributed to it. "The need," they conclude, "for large data sets and data sharing is addressed in AI studies as well and in informatics as we are always in need of the best ways to harness large data sets that answer questions" (p. 4).

Kleinberg, Samantha, and George Hripcsak. "A Review of Causal Inference for Biomedical Informatics." *Journal of Biomedical Informatics* 44.6 (2011): 1102–1112.

After reviewing the core concepts of causal models in biomedicine, the authors conclude that contemporary computational methods, including temporal logic, graphic modeling, and Granger causality, are adequate—although not completely—for inferring causality from large-scale patient data sets. However, they acknowledge that several problems and challenges face the future of this research in terms of establishing with certainty causal inference based on biomedical informatics.

Kumar, Pardeep, Yugal Kumar, and Mohammad A. Tawhid, eds. *Machine Learning, Big Data, and IoT for Medical Informatics*. London: Academic Press, 2021.

The chapters in this edited volume explore the role of machine learning and Internet of Things in the field of medical informatics. After an introductory chapter on basic concepts, the remaining chapters explore the practical dimensions of machine learning in health care and diagnosis. Topics range from blockchain technology to cloud computing. A final chapter examines the advantage of machine learning in operationalizing precision medicine.

Shortliffe, Edward H., and James J. Cimino, eds. *Biomedical Informatics: Computer Applications in Health Care and Biomedicine*. 4th ed. London: Springer, 2014.

This collection of essays on biomedical informatics is divided into two sections. The first deals with the theoretical and technological background of bioinformatics and covers topics including probabilistic reasoning, cognitive science, computer architecture, software engineering, natural language processing, and medical imaging. The second then covers the applications of bioinformatics to the health-care system and clinic in terms of health information infrastructure and management, electronic health records, and patient-centered care systems.

Taylor, Paul. *From Patient Data to Medical Knowledge: The Principles and Practice of Health Informatics*. Malden, MA, and Oxford: Blackwell, 2006.

Begins with introducing the notion of health informatics and the challenges facing its implementation clinically, especially in terms of generating useful medical knowledge. The second part covers various principles involved in health informatics, including standards of health informatics, probability in decision making, and knowledge representation. The final part discusses the changes needed in organizational structure and information technology to implement health informatics.

Clinical Judgment and Decision Making

Clinical reasoning and judgment are paramount for delivering quality health care. Misdiagnosis or an ineffectual therapy may result in irreparable harm to, if not death of, the patient. Traditionally, such reasoning and judgment were considered the outcome of clinical expertise. But that tradition was challenged by Meehl 2013, and the understanding and approach to clinical reasoning and judgment changed considerably. Upshur and Chin-Lee 2017 provides a contemporary overview of clinical decision making and judgement. Braude 2012 incorporates intuition into clinical reasoning, while Marcum 2012 proposes a clinical reasoning model based on the dual process of cognition. Montgomery 2006 and Groopman 2007 are expositions on the process by which doctors think within the clinical setting to arrive at accurate diagnoses and to determine appropriate therapeutic strategies. Higgs, et al. 2008 and Kattan 2009 canvas the nature of clinical reasoning and decision making, expertise, and knowledge.

Braude, Hillel D. *Intuition in Medicine: A Philosophical Defense of Clinical Reasoning*. Chicago: University of Chicago Press, 2012.

Argues for a central role of intuition in clinical reasoning and decision making, particularly in connecting medicine's technical and moral mandates. The author's concept of intuition is not limited to the psychological or neurological but also includes the practical and the phenomenological. Importantly, the intuitive nature of clinical reasoning empowers the clinician to make the necessary decisions that discharge the ethical mandate of providing quality health care.

Groopman, Jerome. *How Doctors Think*. Boston: Houghton Mifflin, 2007.

Explores the mental processes by which physicians make clinical diagnoses, and several of the errors that can be made—unless epistemic caution is exercised when appropriate. As one reviewer of the book observes, it "is intended to inform patients of a fact of which they are probably already aware: their doctors are human and will make mistakes, and as a result, patients who partner with their physicians are more likely to get better care" (Michel Shamy and Ross Upshur, "How Doctors Think (Review)," *Perspectives in Biology and Medicine* 51, no. 1 [2008]: 158).

Higgs, Joy, Mark A. Jones, Stephen Loftus, and Nicole Christensen, eds. *Clinical Reasoning in the Health Professions*. 3d ed. Boston: Elsevier, 2008.

Originally published in 1995, the third edition is divided into six sections. The first covers introductory material on the nature of clinical reasoning, while the next section is on expertise and clinical knowledge. The third section focuses on current trends in clinical reasoning research, and the fourth examines different approaches to clinical decision making. The final two sections examine the role of communication in clinical reasoning and pedagogical issues, respectively.

Kattan, Michael W., ed. *Encyclopedia of Medical Decision Making*. 2 vols. Thousand Oaks, CA: SAGE, 2009.

Covers topics involved in medical decision making that ranges from health-care organizations to patients. Topics are divided into two major categories. The first involves prescriptive measures that constrain decisions based upon cost-effectiveness or quality of care, while the second category pertains to descriptive measures that reflect how decisions are made under biased conditions, patient preferences, or social factors.

Marcum, James A. "An Integrated Model of Clinical Reasoning: Dual-Process Theory of Cognition and Metacognition." *Journal of Evaluation in Clinical Practice* 18 (2012): 954–961.

Combines both analytic and nonanalytic cognitive processes of the dual-process theory of cognition to develop an integrated model for clinical reasoning and decision making. Basically, the clinician begins with nonanalytic processes to make clinical observations and then analytic processes to evaluate them. The outcome of these processes is then monitored via metacognitive processes. In combination, both cognitive and metacognitive processes operate synergistically to enhance future clinical decisions.

Meehl, Paul E. *Clinical versus Statistical Prediction: A Theoretical Analysis and a Review of the Evidence*. Brattleboro, VT: Echo Point Books & Media, 2013.

Originally published in 1954, this celebrated work, with almost five thousand citations, according to Google Scholar, is on the superiority of formal or algorithmic methods over traditional clinical methods in making diagnoses and prognoses. After framing the problem of clinical judgment, the author compares the evidence form twenty studies to demonstrate that formal methods outperform clinical expertise. In this 2013 reprinting, the author defends in a preface his conclusions from criticisms.

Montgomery, Kathryn. *How Doctors Think: Clinical Judgment and the Practice of Medicine*. Oxford: Oxford University Press, 2006.

Claims that clinical judgement reflects Aristotelian phronesis rather than the method of positive science. Strives to redirect the vision of medicine as practice rather than science, arguing scientists reason from cause to effect while clinicians do the reverse. Explores the roles for rules of thumb and algorithms in clinical judgement and the relationship between clinical judgement and the nature of medicine.

Upshur, Ross, and Benjamin Chin-Lee. "Clinical Judgment." In *The Routledge Companion to Philosophy of Medicine*. Edited by Miriam Solomon, Jeremy R. Simon, and Harold Kincaid, 363–371. New York: Routledge, 2017.

Begins with two clinical cases to introduce the complexities and uncertainties often involved in clinical reasoning and judgement. Goes on to define clinical judgement as "the collection of heterogeneous reasoning tasks involved in the formulation of a differential diagnosis, initiating and communicating a management plan, or communicating a prognosis" (p. 365). Concludes by applying that definition to the two clinical cases used to begin the article.

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